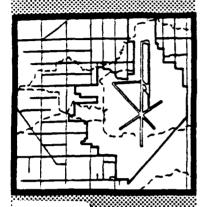
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INSTALLATION RESTORATION PROGRAM STAGE 3 McCLELLAN AIR FORCE BASE

PREPARED BY: Radian Corporation 10395 Old Placerville Road Sacramento, California 95827 DTIC SEP 1 9 1988

SEPTEMBER 1988

## SEMIANNUAL INFORMAL TECHNICAL REPORT

**FINAL COPY** 

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PREPARED FOR: HEADQUARTERS AFLC/DEV WRIGHT-PATTERSON AFB, OHIO 45433

United States Air Force
Occupational and Environmental Health Laboratory (USAFOEHL)
Technical Services Division (TS)
Brooks Air Force Base, Texas 78235-5501

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#### DEPARTMENT OF THE AIR FORCE

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3. If you have any questions or comments, please contact Jerry Robbins, SM-ALC/EMI. (916) 643-1250.

PAUL G. BALNNER

**Deputy Director** 

**Environmental Management** 

1 Atch Report



227-005-03

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# McCLELLAN AFB, CALIFORNIA REMEDIAL INVESTIGATION/FEASIBILITY STUDY SEMIANNUAL INFORMAL TECHNICAL REPORT

FINAL COPY

HEADQUARTERS AFLC/DEV WRIGHT-PATTERSON AFB, OHIO 45433

SEPTEMBER 1988

Prepared by:

Radian Corporation 10395 Old Placerville Road Sacramento, California 95827

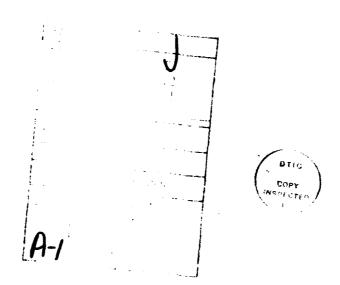
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United States Air Force
Occupational and Environmental Health Laboratory (USAFOEHL)
Technical Services Division (TS)
Brooks Air Force Base, Texas 78235-5501

#### NOTICE

This report has been prepared for the United States Air Force for the purpose of aiding in the implementation of a final remedial action plan under the Air Force Installation Restoration Program (IRP). As the report relates to actual or possible releases of potentially hazardous substances, its release prior to an Air Force final decision on remedial action is in the public interest. The limited objectives of this report and the ongoing nature of the IRP, along with the evolving knowledge of site conditions and chemical effects on the environment and health, must be considered when evaluating this report, since subsequent facts may become known which may make this report premature or inaccurate. Acceptance of this report in performance of the contract under which it was prepared does not mean that the U.S. Air Force or the Department of Defense adopts the conclusions, recommendations, or other views expressed herein, which are those of the contractor only and do not necessarily reflect the official position of either department.



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NAME OF RESPONSIBLE INDIVIDUAL

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#### PREFACE

Radian Corporation is the contractor for the Installation Restoration Program (IRP) Phase II/IVA, Stage 3 Remedial Investigation/Feasibility Study (RI/FS) at McClellan Air Force Base (AFB), California. The work is being performed for the USAF Occupational and Environmental Health Laboratory (USAFOEHL) under USAF Contract No. F33615-87-D-4023.

This Final Copy of the Semiannual Informal Technical Report presents the interpretations of data obtained during the Quarterly Sampling and Analysis Program up to and including the First Quarter 1988. The data evaluated include analytical results for groundwater samples collected from monitoring and extraction wells and groundwater-level data measured from wells on and in the vicinity of McClellan AFB. These data were used to evaluate the effectiveness of current interim remedial measures, and to identify trends developing with time.

Key Radian project personnel were:

Nelson Lund - Contract Program Manager Jack D. Gouge' - Delivery Order Management Morey Lewis - Project Manager Tyler P. Thompson - Project Director

Radian acknowledges the cooperation of the McClellan AFB Office of Environmental Management. In particular, Radian acknowledges the assistance of Mr. Mario Ierardi, Mr. Bud Hoda, and Mr. Gerald Robbins.

The work presented herein was accomplished between 1 April 1988 and 12 September 1988. Lt. Jerald E. Styles was the Technical Program Manager.

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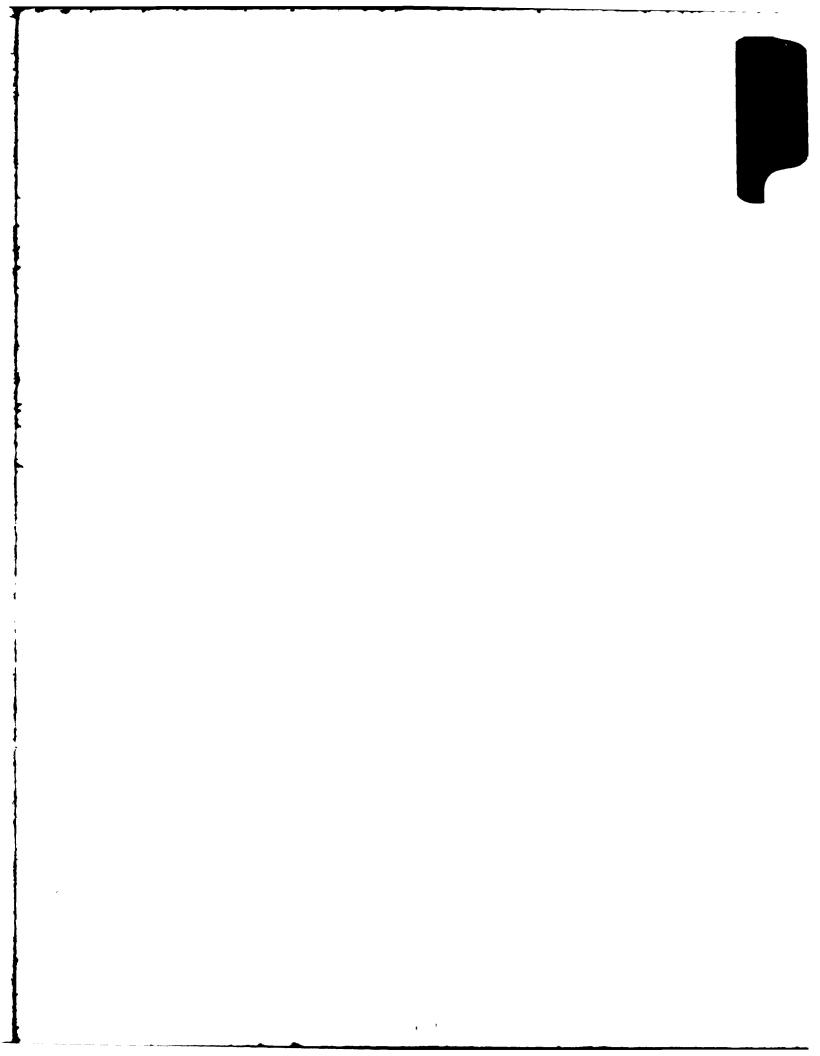
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#### **EXECUTIVE SUMMARY**

This Semiannual Informal Technical Report summarizes the interpretive results for analytical and hydrologic data obtained during groundwater sampling and analysis activities at McClellan AFB from August 1979 through the First Quarter 1988. The data are used to evaluate the occurrence and migration of groundwater contaminants, to assess the variability in the sampling and analytical processes, to identify hydrologic and analytical trends developing with time, and to evaluate the effectiveness of the Area D extraction system.

Analytical data compiled by previous USAF contractors and Radian were used to evaluate the occurrence and migration of groundwater contaminants, specifically chlorinated hydrocarbons (trichloroethene, tetrachloroethene, 1,1-dichloroethene, 1,2-dichloroethane, 1,1-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, chloroform, and carbon tetrachloride). These are the most prevalent contaminants commonly detected in wells located on and in the vicinity of McClellan AFB. Based on evaluation of these data, the predominant factors influencing the migration of contaminants are the physical and chemical characteristics of the aquifer materials and the extraction of groundwater by on-base production and extraction wells and off-base water supply wells. Groundwater flow and contaminant migration is governed locally by the operation of these wells within the study area.

Statistical analyses of analytical results for field and laboratory duplicates were performed to assess total (sampling and analytical) variability. Only data collected from the Fourth Quarter 1985 through the First Quarter 1988 were used for these analyses. This is the only period for which data have been validated by adequate QA/QC and for which consistent and regular sampling of monitoring wells has occurred. Based on a number of field duplicate pairs, sampling (total) variability can be expressed confidently as a relative percent difference (RPD) for three contaminants (trichloroethene, 1,1-dichloroethene, and 1,1-dichloroethane). Analytical variability, a component within sampling variability, cannot be quantified with any statis-

small. During previous quarters, laboratory duplicates were chosen at random by the laboratory. As a result, the majority (75 to 100 percent) of the wells that were chosen for laboratory duplicate analysis contained no detectable concentrations of contaminants and could not be included in the sample of data points. This severely limited the sample size for this analysis. In the future, laboratory duplicates will be chosen prior to the start of sampling activities to ensure that duplicate analyses are performed on wells containing detectable concentrations of contaminants. Nested duplicates (field duplicates and laboratory duplicates for the same well) will also be chosen so that analytical variability can be quantified as a component of total variability.

Concentrations of TCE for two different quarters, Second Quarter 1986 and First Quarter 1988, were plotted to evaluate any trends of lateral contaminant migration. Concentration contours were also estimated to visually aid in detecting lateral movement. Comparison of these maps did not show any significant changes in contaminant concentration over the seven quarter period, indicating contaminant movement in the horizontal direction is slow.

Analyses of analytical and hydrologic data were also performed to:

1) assess whether the variation in concentrations of contaminants could be directly attributed to seasonal factors; 2) to determine if the analytical data were normally distributed; 3) to determine the effectiveness of the Area D Extraction System by evaluating trends in analytical and hydrologic data collected from wells located in Area D and off-base in the Northwest Area.

Several approaches were used to determine whether variability associated with seasonal factors could be quantified. If there is any seasonal variability in network wells, the effect is masked by other factors. Several factors may be masking the seasonal trend analysis. These include the relatively short period for which data have been collected, the influences on contaminant concentrations as a result of implementation of the interim remedial measure in Area D, and potential sources of recharge throughout the

base that may be continually flushing contaminants through the unsaturated zone regardless of seasonal precipitation.

The primary limitation in the seasonal trend analysis is the short period for which validated data are available (Fourth Quarter 1985 to First Quarter 1988). In addition, the two years for which data are available were two very non-normal precipitation years. There was extremely high precipitation in 1986 and extremely low precipitation in 1987. No consistent trends were observed in the analysis of the available data; however, several wells were identified for future assessment of seasonal effects because their analytical results show a possible beginning of cyclic patterns.

Normality testing for groups and individual monitoring wells was conducted to determine whether standard parametric statistics could be applied to the monitoring well results for assessment of trends or patterns in contaminant concentrations. Several parameters were calculated and evaluated, including coefficients of Skewness and Kurtosis, the 'W' statistic, and probability plots. The results for the monitoring wells show a large proportion of zero, or "not detected" values and a few high values. This type of skewed distribution is non-normal. Log transformations of the results were also tested for normality and did not yield a lognormal distribution. The conclusion of the normality testing is that parametric statistical methods cannot be applied to the monitoring well results and that non-parametric or geostatistical methods should be evaluated as potentially valid interpretation tools.

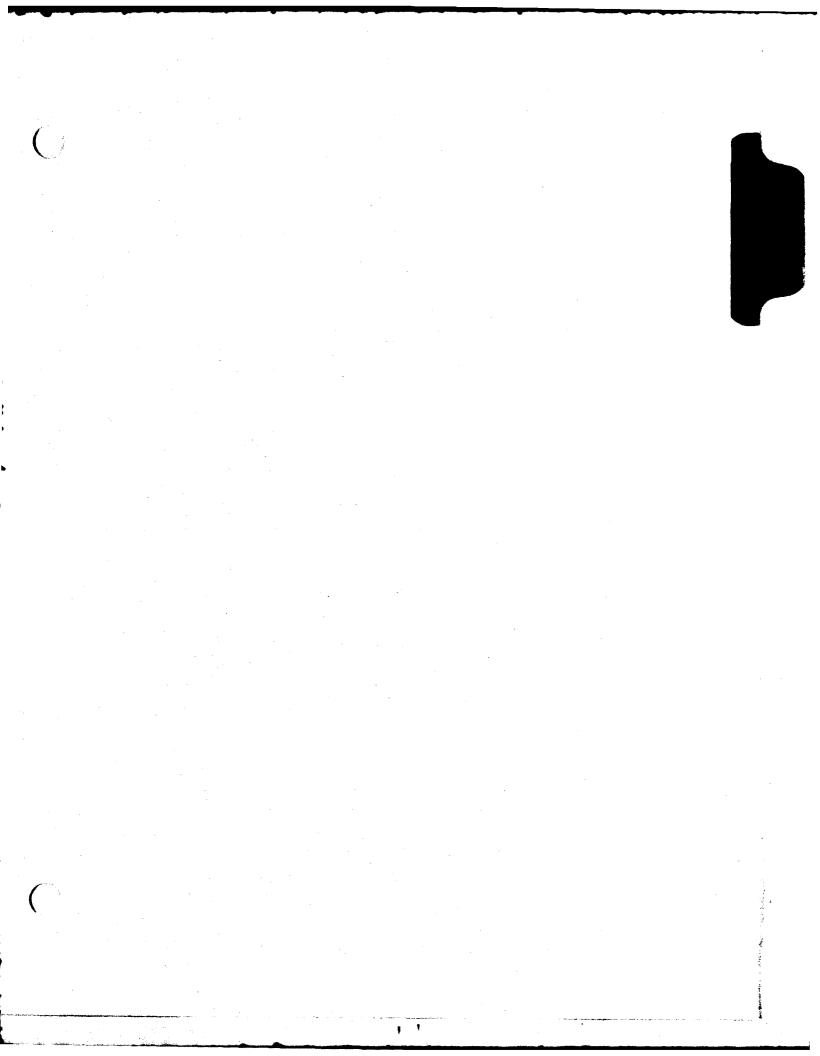
Observed trends in hydrologic and analytical data collected from wells located in Area D and the Northwest Area were evaluated to determine the effectiveness of the Area D extraction system. Based on analyses of the available data, it is possible to conclude that the six Area D extraction wells are removing contaminated groundwater and are influencing local groundwater flow directions in the shallow, middle, and deep monitoring zones. In a little more than a year that the system has been operating, the concentrations of most contaminants detected in monitoring wells in Area D and in the North-

west Area have been reduced by 70 to 100 percent. Several of the monitoring wells no longer contain contaminants at concentrations exceeding state and federal drinking water standards. On the basis of the apparent decreasing concentration trends, further decreases in contaminant concentrations are expected to occur as the system continues to operate.

#### Recommendations

Based on the analyses presented in this report, Radian has made several recommendations regarding sampling of additional non-network monitoring wells. These wells are located in Areas A and B and should aid in the evaluation of contaminant migration from Area A towards base production well BW-18.

Several data limitations are recognized throughout this report. Specific recommendations to address these data limitations are not included in this report since other RI/FS activities (specifically, the Hydrogeologic Assessment and Groundwater Pathways tasks) currently planned for the future will address many of these limitations. The Hydrogeologic Assessment Workplan is currently being reviewed by the USAF.



#### 1.0 INTRODUCTION

This is the first of a series of semiannual informal technical reports to present an interpretation of analytical and hydrologic data obtained from the McClellan AFB Quarterly Groundwater Sampling and Analysis Program. Each semiannual report will focus on answering specific questions concerning the magnitude and extent of groundwater contamination, the effectiveness of existing remedial measures, and contaminant trends that may be developing with time.

This report presents interpretative results of the Quarterly Sampling & Analysis Program data collected from August 1979 through the First Quarter 1988. Interpretations focus on groundwater quality data as well as groundwater flow directions and gradients, the geology and hydrology on and off base, and past waste storage and disposal practices.

This report also presents the results of integrated data analysis and interpretation techniques developed to evaluate analytical data collected during the McClellan AFB Quarterly Groundwater Sampling and Analysis Program through the First Quarter 1988. The objective of the analysis is to identify and quantify any trends or patterns in groundwater contamination on and in the vicinity of the base. The results of this directed study can then be related to the integrated RI/FS that is currently being conducted.

The data in this semiannual informal technical report are from two main sources: Radian data (Fourth Quarter 1985 through First Quarter 1988) and pre-Radian data (pre-1985). The statistical analysis and contaminant migration analysis were performed on data collected and validated by Radian. Pre-Radian data was not used in these analyses because quality assurance practices of previous contractors are not documented. Radian's policy is to use data that have been validated through appropriate quality/quality assurance practices. However, to evaluate the historical occurrence of contaminants, pre-Radian was used. This was necessary because many of these wells have gone dry and could not be sampled by Radian in 1985.

The procedures used for assuring the quality of the data are included in each quarterly report. In general, all validated data have been subjected to quality control samples and analyses such as reagent blanks, field blanks, equipment blanks, duplicate samples, and duplicate analyses. Ambient blanks and trip blanks were first collected during the Fourth Quarter 1987. Appropriate reports for individual data can be referenced by the date accompanying most individual data. The data for each quarter were assessed for accuracy, precision, comparability, and completeness, in accordance with standard practice.

The integrated data analysis used hydrogeologic information, statistical methods, and information about current and past solvent storage and disposal areas to define groundwater contamination patterns, and also to identify limitations in the data. Existing geologic cross sections, water-level data, and potentiometric surface maps were used in the analysis of the extent of water quality contamination by area. The data analysis techniques described in this report include the determination of sampling and analytical variability, initial examination of seasonal effects on contaminant concentrations, normality testing, and development of well "clusters" based on geographic, hydrogeologic, and known outside factors (i.e., production and extraction well-pumping), that may influence contaminant levels. Limitations inherent in the data collected to date during the Quarterly Sampling and Analysis Program are also discussed. These limitations include the relatively short period of sampling for most wells (up to two years), and spatially and temporally discontinuous data.

Section 2.0 of this report presents the physiographic and hydrologic background information. Relevant geologic and hydrologic data from studies conducted by previous USAF contractors, Radian, and state and federal agencies were used in developing this section.

Section 3.0 of this report presents factors that are important to groundwater contaminant distribution and migration, including physical properties of the aquifer and contaminants and activities on and off base. In addition, this section presents the distribution of contaminants in each area and the influence of specific factors on the movement of contaminants.

Section 4.0 presents sampling and analytical variability. The section presents the methods used to determine sampling and analytical variability, and the significance of that variability.

Section 5.0 of this report presents seasonal variability, normality, of the data, and an evaluation of the effectiveness of the Area D extraction system.

Section 6.0 presents recommendations based on review of the available analytical and hydrologic data.

In 1976, the U.S. Department of Defense (DOD) developed the comprehensive Installation Restoration Program (IRP). The purpose of the IRP is to assess and control the migration of environmental contamination that may have resulted from past operations and disposal practices at DOD facilities.

Since the initiation of the IRP, significant experience has been gained in all phases of the program, and the approaches used in the IRP have evolved accordingly. Based on experience at USAF bases nationwide, the USAF has adopted an approach that streamlines and integrates the elements of the program. The integrated IRP approach, which incorporates Phase II with the initial stages of Phase IV, is now referred to as Phase II/IVA (RI/FS).

Groundwater sampling and analysis activities include Phase II/IVA (RI/FS) studies, long-term monitoring, and interim remedial action monitoring. In the spring of 1986, as part of the U.S. EPA Site Mitigation Strategy, McClellan AFB announced plans to implement an interim remedial measure to provide municipal drinking water for approximately 500 residences in an area

west of the base. The hookups of municipal drinking water were completed in June 1987.

#### 1.1 Study Area and Time Period of Interest

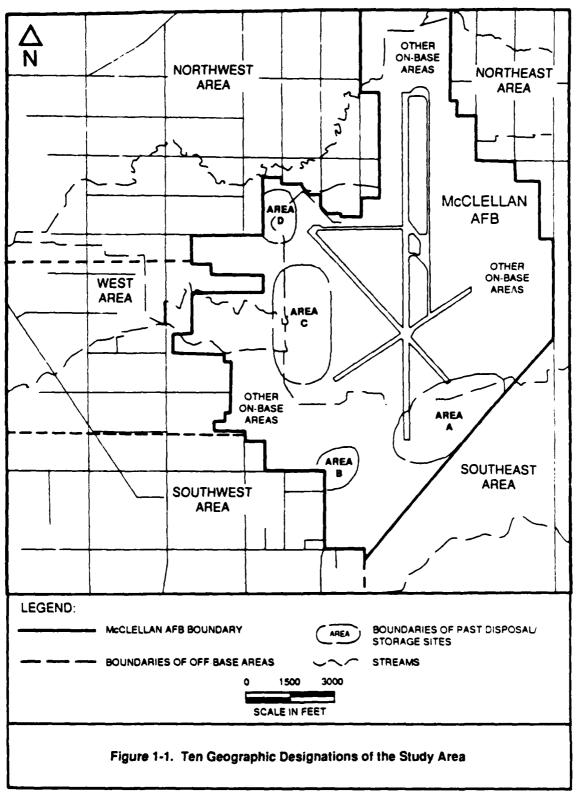
The study area for the Quarterly Sampling and Analysis Program has been divided into 10 geographic areas, which are illustrated in Figure 1-1. Five areas are located on-base and five are located off-base. Areas designated are for the purposes of discussion and are not intended to imply formal boundaries.

#### On-Base Areas

Four general areas of adversely affected groundwater quality have been identified in and adjacent to historical on-base waste disposal and storage sites identified as Areas A, B, C, and D during the Phase I Installation Restoration Program studies. However, until formal boundaries have been established, monitoring wells that are located close to areas A, B, C, and D are designated as being within an "Adjacent On-Base Area" of Areas A, B, C, and D and are grouped with the wells located within one of the four recognized areas. On-base wells that do not occur close to or within one of the four areas are grouped under "Other On-Base Areas" for convenience of discussion. However, the grouping does not imply that the compounds detected in "Other On-Base Areas" have been traced to any particular source.

The five geographic on-base areas are as follows:

- Area A and Adjacent On-Base Areas;
- Area B and Adjacent On-Base Areas;
- Area C and Adjacent On-Base Areas;
- Area D and Adjacent On-Base Areas; and
- Other On-Base Areas.



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#### Off-Base Areas

The five geographic off-base areas were also chosen to group the groundwater network monitoring wells for convenience of discussion and are not meant to infer that groundwater contaminants detected within their boundaries have been traced to any particular source. The five geographic off-base areas are:

- Northeast Area;
- Northwest Area;
- West Area:
- Southwest Area; and
- Southeast Area.

#### Time Period of Interest

Analytical data have been compiled from available technical reports provided by previous USAF contractors and have been useful in determining the detected extent of contamination in the recent past. However, only ground-water quality data collected by Radian since the Fourth Quarter 1985 have been used for statistical analyses. This is because adequate QA/QC is verifiable for this period of sample collection and because the majority of monitoring wells have been sampled continuously since this quarter.

#### 1.2 Groundwater Monitoring Network

The McClellan AFB groundwater monitoring network was established in late 1985 as part of the IRP program. The groundwater monitoring network includes 129 wells (85 on base and 44 off base). Decisions on the wells to be included in the network were made cooperatively by Radian, United States Air Force Occupational and Environmental Health Laboratory (USAFOEHL), McClellan AFB Environmental Management Office, and concerned regulatory agencies (Radian, 1987).

Table 1-1 lists the McClellan AFB groundwater monitoring network wells in the 10 geographic areas. The locations of network wells and other wells are shown on Plate 1, located at the end of this report. Well-specific data for network monitoring wells and extraction wells are included in Tables 1-2 and 1-3, respectively.

All on-base monitoring wells have been assigned numbers less than 1,000. All off-base monitoring wells, with four exceptions, have been assigned numbers greater than or equal to 1,000. The four exceptions are MW-28D and MW-28S, located in the Southeast Area, and MW-74 and MW-76, located in the Northwest Area.

TABLE 1-1. GROUNDWATER MONITORING NETWORK, MCCLELLAN AFB

	W W W W W	# # # # # # # # # # # # # # # # # # #	77 19 14 14 14		H H H H H	10 10 10 10 10 10 10 10 10 10 10 10 10 1	# 10 T	H H H H	N 10 10 10 10 10 10 10 10 10 10 10 10 10
Adjacent On-Base Areas	Adjac	Adjacent On-Base Areas		Adjacent On-Base Areas	Areas	Area 0 and Adjacent On-Base Areas	Area v and int On-Base Ai	reas	Other On-Base Areas
129 TOTAL METWORK WELLS 59 Total Shallow Zone Monitoring Wells 41 Total Middle Zone Monitoring Wells 29 Total Deep Zone Monitoring Wells	Į:								
ON-BASE MONITORING WELLS (85 Total Wells)									
Shallow Zone Monitoring Wells (38 Total Wells)									
89-M-24-M	MV-41S	MJ-120	MA-205	MV-61	10-10	88-M	MY-31S	HH-102	
			MV-215	MV-62	HW-11	69-PM	MU-101	M-106	
			MA-225		MV-12	06-MH	MV-116		
			M4-33S	MV-110	MU-14	16-7			
			365-W		201-14				
			575-M		!				
			RN-458						
			09-M	MV-139					
Hiddle Zone Monitoring Wells (26 Total Wells)	]								
MJ-270 MJ-71	MV-230	HN-121	M4-200	MW-113	MV-52	MV-55	£1-1₹	M-290	
69- <b>M</b>			MW-21D		M-53	15-MH	HV-180	M-100	
			¥-7	MW-129	75-MH	M-70	MV-240	MV-103	
	ľ		MV-108	MW-135		M-72			
Deep Zone Monitoring Wells (21 Total Wells)									
	MA-63	MU-132	MV-22D	MW-112	MV-51	MN-104			
	MV-122		MV-109	MW-130	M4-58	MV-105			
			Mu-133	MW-138	MN-59				
			MU-134	MW-140					
			MV-136	MU-141					
			MV-137	MV-142					
	,			MV-143					

TABLE 1-1. (Continued)

	Southwe	Southwest Area	Vest	West Area	Northwest Area	St Area	Northeast Area
OFF-BASE MONITORING WELLS (44 Total Wells)							
Shallow Zone Monitoring Wells (2) Total Wells)							
MA-1013 MA-1037	MV-1011	MV-1021	MV-1017	MJ-1033	MW-1002	MV-1019	MV-1012
MJ-1014	MW-1016	MV-1023	MJ-1018	M-1036	MN-1004 MN-1005 MN-1009	MJ-1026 MJ-1029 MJ-1041	
Middle Zone Monitoring Wells (15 Total Wells)							
MM-280 MM-1036	MM-1015	MJ-1022	MV-1032	ML-1034	M4-74 M4-76 M4-1003 M4-1010	MJ-1027 MJ-1030 MJ-1042	

<u>Deep Zone Monitoring Wells</u> (8 Total Wells)

MV-1040

MU-1031 MU-1043

MA-1001 MA-1028

MU-1035

MV-1025

• Well not sampled during Second Quarter 1988 because well was dry.

MW = Monitoring well.

NOTE: The letters "S" and "D" associated with monitoring well numbers are part of the well identification notation and do not refer to monitoring zones at McClellan AFB.

		Ground Surface	ound Surface			Screen Interval	Bladder Pump	PCTO
Well Number	Well Depth	Elevation (ft msl)	Casing 1.D. (inches)	Casing	Screen	Intake Depth (ft bgs)	Depth (ft bgs)	Pump Intake (ft bgs)
10	105.0	62.18	0.4	PVC Sch 40	PVC Sch 40	95-105	N.	=
Ξ	105.0	60.13	0.4	PVC Sch 40	PVC Sch 40	95-105	ï	ī
12	105.0	61.26	0.4	PVC Sch 40	PVC Sch 40	95-105	: <b>:</b>	=
*	105.0	64.77	0.4	PVC Sch 40	PVC Sch 40	95-100	=	12
5	105.0	65.62	0.4	PVC Sch 40	PVC Sch 40	95-100	=	7
<b>5</b> 7	130.0	72.99	0.4	PVC Sch 40	SS	120-130	=	¥
<b>18</b> 0	145.0	69.50	0.4	PVC Sch 40	SS	135-145	144	139
195	87.0	58.84	4.0	PVC Sch 40	SS	77-87	=	=
190 B	149.0	58.84	0.4	PVC Sch 40	PVC Sch 40	139-149	=	=
208	0.06	60.37	0.4	PVC Sch 40	SS	. 06-08	=	12
200	155.0	60.37	4.0	PVC Sch 40	SS	150-155	149	140
215	88.0	54.70	4.0	PVC Sch 40	SS	78-88	87	=
210	133.0	54.70	0.4	PVC Sch 40	SS	123-133	132	127
228	87.0	59.84	4.0	PVC Sch 40	SS	77-87	=	=
<b>3</b> 50	163.5	59.84	4.0	PVC Sch 40	SS	153.5-163.5	162	177
230	159.0	58.10	7.0	PVC Sch 40	SS	149-159	158	150
240	159.0	58.00	4.0	PVC Sch 40	SS	149-159	157	146
270	148.0	72.22	0.4	PVC Sch 40	SS	138-148	=	=

a The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not refer to monitoring zones at McClellan AFB.

2088/091088/HMM

Bgs = Below ground surface. C Msl = Mean sea level. d MW-19D is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this table.

Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen cap and not to the original ground surface.

NA a Not eveilable.

NI = Not installed.

SS = Stainless steel.

PVC = Polyvinyl chloride.

		Ground Surface				Screen Interval	Bledder Pump	-01704
Mumber	Well Depth	Elevation (ft msl)	Casing 1.0. (inches)	Casing Material	Screen	Intake Depth (ft bgs)	Depth (ft bgs)	Pump Inteke (ft bgs)
280	130.0	72.92	0.4	PVC Sch 40	SS	120-130	i w	=
230	147.0	09.89	0.4	PVC Sch 40	SS	137-147	146	141
318	102.0	65.80	6.0	PVC Sch 40	SS	82-102	=	=
338	97.0	58.02	0.4	PVC Sch 40	88	87-97	96	*
348	98.0	58.17	6.0	PVC Sch 40	SS	78-88	=	<b>X</b>
368	92.0	56.80	0.4	PVC Sch 40	SS	82-92	2	=
415	110.0	94.00	0.4	PVC Sch 40	SS	100-110	109	Ħ
549	93.0	53.70	4.0	PVC Sch 40	SS	83-93	85	17
455	90.06	99.09	4.0	PVC Sch 40	88	90-90	=	=
51	192.0	63.89	<b>6.</b> 0	Steel	88	177-192	190	142
25	157.0	59.14	6.8	Steel	88	147-157	156	139
53	141.0	64.21	7.6	Steel	SS	130-140	139	134
24	155.0	60.34	6.8	Steel	SS	142-152	151	144
22	145.0	66.52	7.2	Steel	SS	134-164	143	136
22	148.0	67.79	6.8	Steel	SS	137-147	146	132
28	187.0	59.83	6.2	Steel	SS	172-182	181	140
29	179.0	57.68	6.2	Steel	Steel	164-174	173	165
9	107.0	58.87	6.2	Steel	Steel	92-102	5	8
5	111.0	59.70	6.2	Steel	Steel	96-106	105	8

The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not

2088/091088/HMM

best to monitoring zones at McClellan AFB.

Bas = Below ground surface.

C Msl = Mean sea level.

MW-19D is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this teble.

<sup>•</sup> Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen cap and not to the original ground surface.

MA = Not available. MI = Not installed.

SS \* Stainless steel.

PVC = Polyvinyl chloride.

	9					Nund Surface Screen Interval Bladder Pumb	Bladder Pump	
Well Number	well Depth (ft bgs)	Elevation (ft msl)	Casing 1.D. (inches)	Casing Material	Screen	Intake Depth (ft bgs)	Depth (ft bgs)	Pump Intake (ft bgs)
29	113.0	57.94	8.2	Steel	Steel	98-108	17	*
63	179.0	62.98	8.2	Steel	Steel	164-174	171	149
29	115.0	71.62	6.2	Steel	Steel	100-110	109	103
8	131.0	71.77	6.2	Steel	Steel	116-126	=	12
69	180.0	70.35	8.2	Steel	Steel	150-170	169	153
2	142.0	60.14	6.2	Steel	Steel	127-137	136	131
2	141.0	73.10	8.2	Steel	Steel	120-136	=	I X
22	136.0	62.58	4.1	Steel	Steel	121-131	130	124
2	141.0	54.61	6.2	Steel	Steel	126-136	=	×
ĸ	130.0	58.16	8.2	Steel	Steel	115-125	=	Ħ
92	148.0	53.77	6.2	Steel	Steel	134-144	=	=
20	111.0	57.54	0.4	Steel	Steel	96-106	105	H
69	113.0	59.11	0.4	Steel	Steel	98-108	107	=
8	111.0	61.06	0.4	Steel	Steel	96-106	105	=
5	107.0	56.15	0.4	Steel	Steel	92-102	101	Ħ
26	109.0	55.61	0.4	Steel	Steel	94-104	103	ï
90	174.8	78.94	0.4	SS/PVC	SS	164.8-174.8	174	157
101	119.5	78.27	0.4	SS/PVC	SS	109.5-119.5	119	=
102	117.0	80.93	4.0	SS/PVC	SS	107-117	16	ï

The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not b refer to monitoring zones at McClellan AFB.

2088/091088/HMM

Bgs = Below ground surface.

Msi = Mean sea level.

MW-190 is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this

table. Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen cap and not to the original ground surface.

NA \* Not available.

W] = Not installed.

SS = Stainless steel.

PVC = Polyvinyl chloride.

<sup>(</sup>Continued)

The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not refer to monitoring zones at McClellan AFB.

Bgs = Below ground surface.

Msl = Mean sea level.

MM-190 is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this

Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen cap and not to the original ground surface.

<sup>-</sup> Not available.

<sup>\*</sup> Not installed.

s = Stainless steel.

PVC = Polyvinyl chloride.

<sup>(</sup>Continued) (Continued)

	特別時期發展時時時時時時間的時時時期的前時時時期							
		Ground Surface				Screen Interval	Bladder Pump	Purge
Well Bumber	Well Depth (ft bgs)	Elevation (ft msl)	Casing 1.D. (inches)	Casing	Screen	intake Depth (ft bgs)	Depth b (ft bgs)	Pump Intake (ft bgs)
130	189.0	59.21	0.4	SS/PVC	\$\$	179-189	188	144
131	8.8	59.18	6.0	SS/PVC	SS	84.5-99.5	8	=
132	218.3	62.51	4.0	SS/PVC	SS	208.3-218.3	217	151
133	260.0	57.94	4.0	SS/PVC	SS	217-227, 237-247	215	116
134	185.0	58.38	6.0	SS/PVC	SS	165-175	156	116
135	130.0	57.94	4.0	SS/PVC	88	109-119	108	116
136	255.0	57.77	6.0	SS/PVC	SS	230-245	235	116
137	182.0	58.24	4.0	SS/PVC	SS	162-172	159	116
138	254.3	77.09	0.4	SS/PVC	88	210-220	205	116
139	121.0	\$6.65	4.0	SS/PVC	SS	100-110	101	111
140	200.0	56.58	4.0	SS/PVC	SS	180-190	177	116
141	245.0	56.55	6.0	SS/PVC	SS	230-240	524	116
142	180.0	57.46	6.0	SS/PVC	88	160-170	158	116
143	193.0	29.40	4.0	SS/PVC	88	173-183	171	116
1000	138.0	58.53	4.0	SS/PVC	SS	128-138	137	131
1001	166.5	51.25	4.0	SS/PVC	SS	156.5-166.5	165	129
1002	92.5	56.65	0.4	SS/PVC	SS	82.5-92.5	95	H
1003	139.0	51.28	4.0	SS/PVC	SS	129-139	138	131
1004	92.5	51.62	0.4	SS/PVC	SS	82.5-92.5	5	

The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not refer to monitoring zones at McClellan AFB.

2088/091088/HHM

Bgs = Below ground surface.

Hat a Mean sea tevel.

MW-190 is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this

Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen cap and not to the original ground surface.

<sup>=</sup> Not available.

<sup>=</sup> Not installed.

SS = Stainless steel. PVC = Polyvinyl chloride.

9		Ground Surface				Screen Interval	Bladder Pump	Purge
Well Number	Well Depth (ft bgs)	Elevation (ft msl)	Casing 1.D. (inches)	Casing Material	Screen Naterial	Intake Depth (ft bgs)	Depth (ft bgs)	Pump Inteke (ft bgs)
1005	90.0	51.26	0.4	SS/PVC	SS	06-08	68	=
1009	92.5	57.82	4.0	SS/PVC	SS	82.5-92.5	16	=
1010	148.0	51.63	7.0	SS/PVC	SS	138-148	147	131
101	95.4	54.75	4.0	SS/PVC	SS	85.4-95.4	*	=
1012	107.0	78.64	4.0	SS/PVC	SS	701-76	106	=
1013	0.66	57.34	0.4	SS/PVC	SS	89-99	8	=
1014	105.5	27.99	4.0	SS/PVC	SS	95.5-105.5	104	7
1015	141.0	29.54	0.4	SS/PVC	SS	131-141	140	134
1016	105.5	56.34	0.4	SS/PVC	SS	95.5-105.5	104	=
1017	90.0	51.80	4.0	SS/PVC	SS	80-90	8	=
1018	0.66	47.51	0.4	SS/PVC	SS	89-99	86	=
1019	91.0	45.05	4.0	SS/PVC	SS	81-91	8	7
1020	106.7	57.82	4.0	SS/PVC	SS	96.7-106.7	106	=
1021	110.6	63.24	0.4	SS/PVC	SS	100.6-110.6	110	=
1022	158.4	63.13	0.4	SS/PVC	SS	148.4-158.4	157	151
1023	116.5	52.96	4.0	SS/PVC	SS	106.5-116.5	115	=
1024	146.5	53.04	0.4	SS/PVC	SS	136.5-146.5	145	139
1025	196.5	53.65	7.0	SS/PVC	SS	186.5-196.5	195	146
1026	101.5	59.57	4.0	SS/PVC	SS	91.5-101.5	100	=

The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not refer to monitoring zones at McClellan AFB.

Bgs = Below ground surface. C Msl = Mean sea level. d Mw-190 is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this

table. Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen

NA = Not available.

MI = Not installed. SS = Stainless steel.

PVC = Polyvinyl chloride.

	Ground Surface	Ground Surface				Screen interval Bladder Pump	Bledder Pump	
Number	well Depth (ft bgs)	Elevation (ft msl)	Casing 1.D. (inches)	Casing Material	Screen	Intake Depth (ft bgs)	Depth (ft bgs)	Pump Intake (ft bgs)
1027	140.0	59.53	0.4	SS/PVC	SS	130-140	139	131
1028	188.7	29.40	6.0	SS/PVC	SS	178.7-188.7	185	142
1029	86.8	50.37	0.4	SS/PVC	SS	76.8-86.8	92	=
1030	158.7	50.17	4.0	SS/PVC	SS	148.7-158.7	158	129
1031	196.0	20.42	6.0	SS/PVC	SS	186-196	195	131
1032	157.9	47.23	0.4	SS/PVC	SS	147.9-157.9	157	131
1033	86.2	97.87	6.0	SS/PVC	SS	76.2-86.2	85	=
1034	138.7	48.31	0.4	SS/PVC	SS	128.7-138.7	138	130
1035	198.3	48.57	4.0	SS/PVC	SS	188.3-198.3	197	132
1036	74.8	38.60	6.0	SS/PVC	SS	64.8-74.8	22	~
1037	105.7	62.21	0.4	SS/PVC	SS	95.7-105.7	105	=
1038	148.2	61.67	0.4	SS/PVC	SS	138.2-148.2	147	142
1039	2007	61.74	0.4	SS/PVC	SS	190.7-200.7	200	147
1040	206.1	80.01	0.4	SS/PVC	SS	196.1-206.1	205	166
1041	110.9	48.03	0.4	SS/PVC	88	100.9-110.9	110	104
1042	138.0	47.82	0.4	SS/PVC	SS	128-138	137	129
1043	195.0	47.91	0.4	SS/PVC	SS	185-195	194	129

The letters "S" and "D" associated with the monitoring well numbers are part of the well identification notation and do not refer to monitoring zones at McClellan AFB.

Bgs = Below ground surface.

Mst = Mean sea level.

MM-190 is a non-network monitoring well. This well is sampled every other quarter and therefore, was included in this

Well casing was extended during construction of the Area D cap. The depth shown is referenced to the top of the earthen cap and not to the original ground surface.

<sup>=</sup> Not available.

**<sup>=</sup> Not installed.** 

SS = Stainless steel. PVC = Polyvinyl chloride.

TABLE 1-3. WELL SPECIFIC DATA FOR EXTRACTION WELLS LOCATED ON MCCLELLAN AFB, SECOND QUARTER 1988 SAMPLING AND ANALYSIS PROGRAM

		Ground Surface				Screen Interval	Submersible
Well	Well Depth (ft bgs)	Elevation (ft msl)	Casing I.D. (inches)	Casing Material	Screen	Intake Depth (ft bgs)	Pump Depth (ft bgs)
۲ در	164	NA	8.0	Steel	SS	40-160	145
EV-83	571	¥#	8.0	Steel	SS	40-160	145
-84	170	¥ N	<b>8</b> .0	Steel	SS	40-160	145
-85	170	¥#	8.0	Steel	SS	40-160	145
-86	170	NA NA	8.0	Steel	SS	40-160	145
-87	170	¥2	8.0	Steel	SS	40-160	145

Bgs # Below ground surface.

Msi # Mean sea level.

NA = Not available. SS = Stainless steel.



#### 2.0 PHYSIOGRAPHIC AND HYDROLOGIC SETTING

McClellan AFB is located near the eastern edge of the Sacramento Valley, an area characterized by low topographic relief. The land surface at McClellan AFB has a slope of about 2 percent from the east to the west. The major drainages in the vicinity are the Sacramento and American rivers. The Sacramento River flows approximately six miles west of the base and the American River is located approximately seven miles to the south.

The Sacramento Valley is a large depositional basin, filled with thick sequences of sediments eroded from the Sierra Nevada to the east and the Coast Range to the west. The north-south trending valley is a synclinal trough (basin) that has been filled with as much as 60,000 feet of sediments. Over 4,000 feet of sediments are estimated to have been deposited in the valley since the Eocene Epoch (about the last 60 million years). These sedimentary deposits are wedge-shaped, with the thickest sediments located near the west side of the valley. Very little structural displacement of the sediments has occurred in the geologic history of this area (California Department of Water Resources, 1974).

The oldest and deepest fresh-water aquifer in the Sacramento area is the Mehrten Formation. The Mehrten Formation, which is Miocene to Pliocene in age, consists of volcaniclastic deposits (predominantly tuff-breccia) interbedded with clays. The Tertiary-Quaternary deposits that overlie the Mehrten Formation are also a source of fresh water. In the vicinity of McClellan AFB these deposits include the Victor, Laguna, and Fair Oaks formations.

#### 2.1 Local Geology

#### 2.1.1 Soils

Soil types in the vicinity of McClellan AFB are extremely variable. The surface soils (less than 5 feet deep) are composed of mixed alluvium derived from a variety of sources, mainly granitic rock. Most of the soils

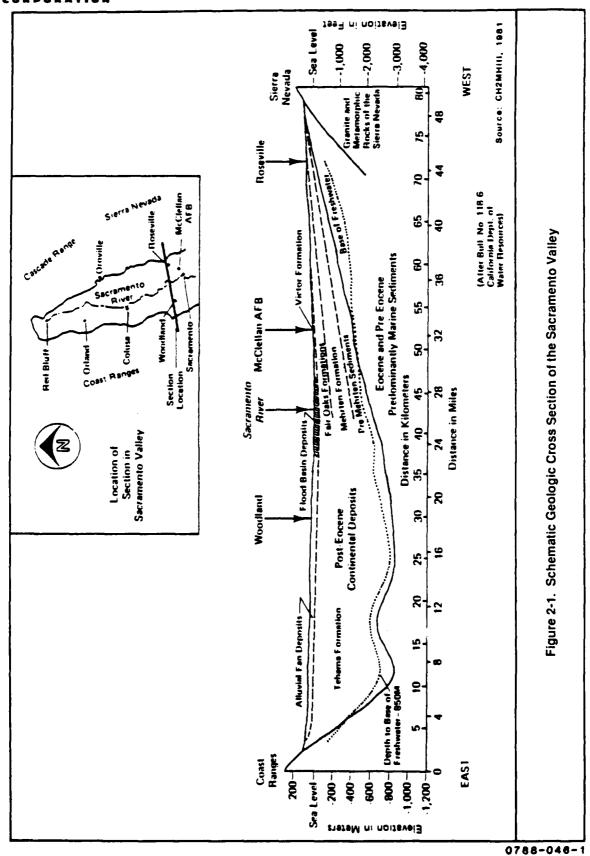
have been in place long enough to have developed a silica cementation ("hard-pan") at a depth of 20 to 40 inches. Surface textures are predominantly loam and sandy loam, underlain by finer-textured loam and sandy clay loam horizons over the hardpan. Soil permeabilities range from 0.6 to 2.0 inches per year, depending on local conditions. The local soils are generally classified as San Joaquin fine sandy loam, Fiddyment fine sandy loam, or San Joaquin-Xeralfic Arents complex. These soils have a low shrink-swell potential, a slight erosion potential, and a very low available water capacity of approximately 0.10 to 0.14 inches of water per inch of soil. Natural soil conditions may not be represented at McClellan AFB due to excavation and disturbance by past on-base activities.

## 2.1.2 Geologic Units

As shown in Figure 2-1, the Victor, Fair Oaks, Laguna, Mehrten, and Pre-Mehrten Formations underlie McClellan AFB. These geologic formations are of primary concern for this report because they form fresh-water aquifers accessed by McClellan AFB, and have experienced water quality degradation from on-base sources. Groundwater used by the base is pumped from the Fair Oaks, Laguna and Mehrten formations.

Typical lithologies in the fluvial deposits at McClellan AFB include heterogenous sands, silts, clays and, rarely, gravels in upward-fining sequences that appear to be repeated through the upper 220 feet of the subsurface. The textures range from clean well-sorted sand, to clayey silty sand, to silty clay. Pure clay is very rare. Sand bodies grade laterally to various proportions of silty and clayey sand. The clean, well-sorted sands may occupy subsurface channels, and erosional contacts may be inferred where well-sorted sands occur laterally adjacent to silt or clay. Deposits also grade laterally through various proportions of silt and clay.





#### 2.2 <u>Local Groundwater Hydrology</u>

The aquifer system beneath McClellan AFB is comprised of a succession of relatively permeable sandy deposits interbedded with less permeable deposits of silt and silty clay. The waterbearing strata above 120 feet are generally unconfined; the waterbearing strata below 120 feet are generally semi-confined. Strata within the unconfined zone and semi-confined zone are believed to be interconnected because of the heterogenous nature of the local sedimentary deposits and the absence of a laterally extensive, low permeability, confining layer. The lateral discontinuity and facies changes within the semi-confining layers allow contaminants to move vertically between the various waterbearing zones.

Near the base, groundwater occurs primarily in the Fair Oaks-Laguna and Mehrten formations. The water table is typically 80 to 110 feet below the ground surface, with seasonal fluctuations of about 2 feet. Groundwater recharge in the eastern portion of the Sacramento Valley occurs as a result of infiltration from streams, rivers, rainfall, and irrigation and runoff from the foothills of the Sierra Nevada. The uppermost waterbearing zone in the Sacramento Valley is recharged by groundwater flow and through percolation of surface water. Groundwater in the deeper waterbearing zones originates in recharge areas in the Sierra Nevada foothills east of McClellan AFB. Groundwater discharge in the Sacramento Valley occurs predominantly through pumping.

The Fair Oaks and Laguna formations have generally low to moderate hydraulic conductivity except where coarse-grained channel deposits are present. In these more permeable materials, well yields may reach 3,500 gallons per minute (GPM), with drawdowns of approximately 30 feet, resulting in a specific capacity of about 120 GPM per foot (GPM/ft) of drawdown (California Department of Water Resources, 1974). The black sands of the Mehrten Formation generally demonstrate a specific capacity of approximately 45 GPM/ft. Specific capacities as high as 100 GPM/ft, however, have been noted in the Mehrten Formation (California Department of Water Resources, 1974).

Radian has defined three monitoring zones based on the elevation of monitoring well screens and correlation of geologic logs. These zones were designated to provide control for groundwater-level measurements, to determine horizontal and vertical groundwater gradients, and to monitor the extent of groundwater contamination. Within each of these zones are coarser-grained, high-permeability layers separated by low-permeability layers. Textures of the layers range from well-sorted sands to clayey, silty sand to silty clay.

These zones, designated by elevation and not by separate and distinct hydrogeologic units, are:

- Shallow: above -55 feet mean sea level (msl);
- Middle: between -55 to -100 feet msl; and
- Deep: below -100 feet msl.

With the exception of monitoring wells MW-1023, MW-1041, MW-1030, and MW-1032, wells are assigned to a monitoring zone based on the elevation of the bottom of the well screen. Due to the depth to the water table, relatively low ground surface elevation, and site-specific hydrogeologic conditions, monitoring wells MW-1023 and MW-1041 have been assigned to the shallow monitoring zone even though the bottom of screen elevations are between -55 and -100 feet msl (middle monitoring zone). Although these wells are screened within the middle monitoring zone, MW-1023 and MW-1041 were assigned to the shallow monitoring zone because the first saturated material was encountered at this depth while drilling. Similarly, monitoring wells MW-1030 and MW-1032 were assigned to the middle monitoring zone even though the bottom of screen elevations are below -100 feet msl (deep monitoring zone). These wells were assigned to the middle monitoring zone because the second occurrence of saturated material (typically representing the middle monitoring zone) was encountered below -100 feet msl while drilling.

#### 2.2.1 Aquifer Parameters

Aquifer parameters have been characterized by several methods. Multiple well aquifer tests in which one well is pumped and drawdown is observed in other wells have been conducted in Areas B, C, and D. Single well tests have been conducted in Area A and in various monitoring wells on and off base. A summary of the test results obtained by CH2M Hill, Engineering-Science, McLaren, Radian, and EG&G, Idaho is presented in Table 2-1.

#### 2.2.2 Flow Characteristics

During the early 1900s, groundwater in the vicinity of McClellan AFB moved from areas of recharge in the northeast to areas of discharge in the southwest (Figure 2-2) in response to the natural hydraulic grandient. Since the turn of the century, the local extraction of groundwater for irrigation, industrial, municipal, and domestic use has dramatically altered groundwater levels and gradients. By 1960, groundwater pumping had increased such that the rate of withdrawal began to exceed the rate of recharge, and groundwater levels began to decline. Under these conditions, local horizontal gradients underwent marked changes in direction and magnitude, and local groundwater depressions began to develop in areas of maximum withdrawal. At this time, a major regional pumping depression is approximately centered just south of McClellan AFB, as shown in Figure 2-3. This depression has resulted in a change in the local groundwater flow direction such that flow is now generally to the south, as shown in Figure 2-4.

Monitoring wells have been installed on and in the vicinity of McClellan AFB as shown in Plate 1, located at the end of this report. Currently, groundwater levels in 136 monitoring and extraction wells are measured monthly as part of the Quarterly Groundwater Sampling and Analysis Program. Each monitoring well has been grouped into one of the three monitoring zones (shallow, middle or deep) described previously. Groundwater-level measurements from the monitoring wells are used to produce potentiometric surface

	Monitoring	Transmissivity [gpd/ft]	[gpd/ft]	Hydraulic Conductivity [Spd/ft <sup>2</sup> ]	inductivity ft <sup>2</sup> ]	Storetivity [x10 <sup>-4</sup> ]	[x10 <sup>-4</sup> ]
Contractor	Zone	Range	Averege	Range	Average	Range	Average
Radian	Middle	7,700 - 8,600	8,000	260 - 290	270	1.3 - 6.2	3.0
(Area C)	Deep	7,600 - 15,000	12,000	250 - 500	390	1.6 - 0.87	1.6
CHEM HILL	Shallow	17,500 - 28,600	16,525	N.	NR (725) b	9.0 - 62.0	<b>4</b> 0
(Area D)	Middle	2,300 - 19,300	9,850	æ	NR (315) <sup>b</sup>	3.0 - 11.0	8.0
McLaren (Area D)	Shallow, Middle & Deep	6,851 - 19,110	12,000	æ	S.	5.0 - 91.0	30
Engineering-Science (Area C)	Shallow	21 (one value reported)	2	4 G	4.2	æ	Œ
McLaren [Area C]	Middle	1,200 - 1,900		97 - 120	109	W	
EG&G Idaho, Inc. (Area C)	Middle	13,750 - 3,000	2,500	Œ Œ	NR (83) <sup>b</sup>	Q	

Specific yield not reported for unconfined condition in shallow monitor zone.

b cyronic street and setimeted by Radian based on reported transmissivity value and aquifer thickness.

NR = Not reported.

ND = Not determined.

CN M Hill, August 1984. "Hydrogeologic Eveluation of Area D McClellan AFB, California" IRP Phase IIVIV Tech Memo Number 3. SOURCE:

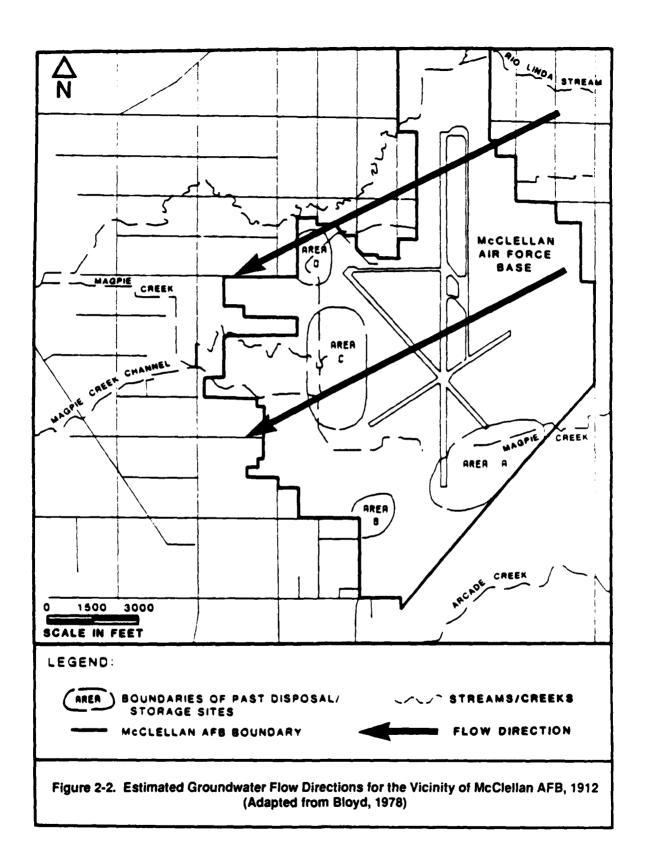
Engineering-Science, 1983. "Final Report, Installation Restoration Program, Phase II - Confirmation, McClellan AFB, California." Engineering-Science, Arcadia, California.

McLeren Environmental Engineering, January 1986a. "Area D Monitoring/Extraction System, Technical Report No. 2, Testing of Initial Extraction Well and System Confirmation by Computer Modeling," prepared by McLaran Environmental EG & G Idaho, Inc, "Hydrogeologic Assessment Report for the Surface Impoundment, Area "C", McClellan Air Force Base, Engineering, Sacramento, California, for McClellan AFB, Sacramento, California, Contract No. FO4699-85-COO20.

Radian Corporation, 1986. "Installation Restoration Program, McClellan AFB, California, Phasa II, Monitoring Well Sacramento, California, "Project Number PRJY871509, December 1987,

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Installation, Stage 2-2", 3 Volume.



2-8

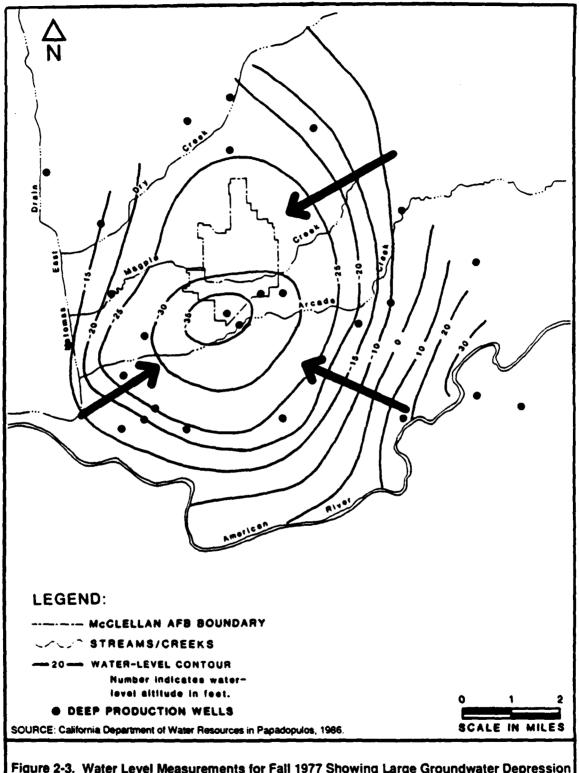
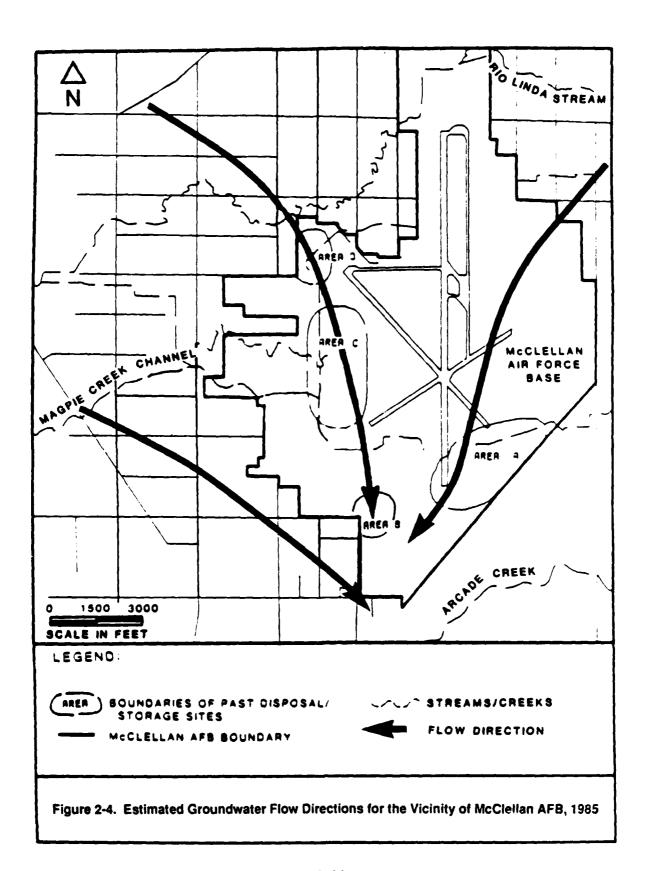


Figure 2-3. Water Level Measurements for Fall 1977 Showing Large Groundwater Depression in the Vicinity of McClellan AFB



2-10

maps for the three monitoring zones. The potentiometric maps are used to determine groundwater flow directions, including local deviations from the regional flow pattern. Pumping of on-base production wells and extraction wells affects local groundwater flow directions as shown on the potentiometric surface maps for March 1988 (Plates 2, 3, and 4).

The regional groundwater flow direction is to the south-southwest. In the northern end of the base, groundwater flow appears to be toward the south, following the regional trend. However, groundwater flow deviates from this regional flow pattern near the Area D extraction wells and active base production wells. The influence of the Area D extraction system is evident in the northwestern portion of the base. Potentiometric surface maps indicate that the extraction system is restricting groundwater from flowing off base in that area and is inducing groundwater flow toward the Area D extraction wells. In the eastern portion of the base there are several active base production wells (BW-10, BW-20, and BW-29). Groundwater flow in this area is probably influenced by the production wells, but the areal extent of their effect cannot be determined due to the limited of monitoring wells in this area. In the southern portion of the study area, groundwater flow appears to converge towards base production well BW-18. There are other active water supply wells to the south and southwest of the base that may also be influencing flow, but their effect cannot be defined because of the limited number of monitoring wells in this area. The potentiometric surface maps generated from the existing water-level data do show that BW-18 has a strong influence on local groundwater flow.

Over the last six quarters, (Fourth Quarter 1986 to First Quarter 1988), groundwater flow directions appear to have changed in two sections of the study area. In Area D, the direction of groundwater flow was off base to the northwest in all three monitoring zones during the Fourth Quarter 1986. The effect of the Area D extraction system is clearly evident on the potentiometric maps for all three monitoring zones in March 1988 (Plates 2, 3, and 4). Also, in the southern portion of the study area, the influence of

BW-18 can be seen more easily, as additional monitoring wells were added to the network over the past six quarters.

#### 2.2.3 <u>Natural Groundwater Quality</u>

for irrigation and domestic uses. The groundwater is characterized as a sodium-calcium or calcium-magnesium bicarbonate type (CH2M Hill, 1981). As determined in Stage 2-1 of the IRP, sodium concentration ranges from about 11 to 53 mg/L, calcium concentration ranges from 9.3 to 35 mg/L, and magnesium concentrations range from 9.1 to 23 mg/L. Total dissolved solids average about 240 mg/L. Average sulfate and nitrate concentrations are approximately 21.6 and 1.9 mg/L, respectively. Specific monitoring zones or geographic areas on base do not exhibit distinctive water-quality characteristics (Radian, 1985).



#### 3.0 CONTAMINANT DISTRIBUTION AND MIGRATION

This section describes the distribution and migration of contaminants beneath McClellan AFB on the basis of the available analytical data for groundwater and the present level of understanding of physical, chemical, and chronologic parameters. Parameters having had a historical and a continuing impact on contaminant concentrations and distribution consist of four basic types:

- Source area (location, size, and content);
- Chemical and physical parameters of contaminant compounds;
- Characteristics of the vadose zone;
- Hydrogeologic characteristics of the saturated zone; and
- Chronologic parameters:
  - the time interval of contaminant release from source areas,
  - travel time through the vadose zone, and
  - the time that a contaminant has traveled toward a water supply or monitoring well in the groundwater.

The following discussion begins with known or potential sources of contaminants and identifies potential migration pathways through the vadose and saturated zones to McClellan AFB monitoring wells. Quantifiable, estimated, and unknown parameters and interactions are described as they relate to the path of migration.

#### 3.1 <u>Potential Sources of Contaminants</u>

Potential sources of contaminants detected in groundwater on McClellan AFB are former waste disposal and chemical storage sites that have

been identified in previous and ongoing investigations. Additional potential sources, referred to as Potential Release Locations (PRLs), have been recognized from historical aerial photos and other records. The information available for all PRLs, previously investigated or uninvestigated, is listed in tables in Appendix A. Because investigations of all identified sources and PRLs are not complete at this time, their physical and chronologic parameters and the characteristics of chemical compounds present have not been defined. The following section describes the available information for waste disposal and chemical storage as it relates to contaminant distribution and migration.

#### 3.1.1 Waste Disposal Practices and Chronology

McClellan AFB was established in 1936 and became operational in 1937. The operations at McClellan AFB relate to the management, maintenance, and repair of various aircraft and electronics and communications equipment. These activities, conducted since the base was established in 1936, have required the use of various hazardous and toxic materials. A summary of past waste disposal practices is presented below. The summary was compiled through review of historical data and from published reports by previous USAF contractors.

1940s: Trichloroethene (TCE), other solvents, and oils were burned at a pit in Area C.

1950s to Early 1960s: TCE was distilled on base. Although attempts were made to reuse the chemical on base, the distillation process was ineffective, and TCE wastes were disposed in a burn pit (Disposal Site 22). The burn pit was used in the 1940s, 1950s, and early 1960s and subsequently filled and closed in 1968.

1962 to 1963: A program was initiated to reclaim commingled oils and solvents for sale through the Defense Property Disposal Office

(now referred to as the Defense Reutilization and Marketing Office). TCE disposal through oil/solvent reclamation was ineffective because the TCE settled to the bottom of the holding tanks. Segregation of all wastes containing TCE for disposal at the base sludge pits (Disposal Sites 2, 4, 5 7, and 8) then became the standard practice.

1963 to Early 1970s: TCE wastes continued to be disposed of at the sludge pits. However, due to concerns related to air pollution, the use of TCE at the base was significantly reduced and then phased out. Other cleaning solvents, such as tetrachloroethene, trichlorofluoromethane, and 1,1,1-trichloroethane were substituted for TCE.

1976: Solvent disposal at the sludge pits was significantly reduced. Solvents were containerized and transported to off-base state-approved chemical landfills or to reclamation facilities.

<u>Late 1978</u>: The use of TCE on base was banned due to concerns about air pollution.

<u>Early 1981</u>: On-base disposal of industrial wastewater sludge was discontinued. All industrial wastewater sludge was transported off base for disposal at a Class I landfill.

1982 to Present: Waste disposal on base has been restricted to small amounts of demolition debris, treated industrial wastewater, and sewage grit. Private contractors and Sacramento County have collected solid refuse since 1968.

## 3.1.2 <u>Detection of Contaminants in On-Base Production Wells</u>

Contaminants have been detected historically in water supply wells located on- and off-base. In 1956, base production well BW-7, located in what is now Area A, was found to be contaminated by unspecified hydrocarbons and

phenols. The well was subsequently taken out of service. Beginning in 1979, McClellan AFB began studying the groundwater quality problem and developing measures to remediate the problem.

In 1979, base groundwater supplies were found to be contaminated by volatile organic compounds (VOCs). Of principal concern was the presence of TCE (Luhdorff and Scalmanini, 1984). Throughout November 1979, on- and off-base sampling resulted in identification of three areas of TCE contamination. These areas are now designated as Areas A, B, and D. As a result of the initial sampling, three off-base and two McClellan AFB groundwater supply wells (BW-1 and BW-2) were shut down due to volatile organic compound contamination. Two of the three off-base wells are private household wells and the third belongs to the City of Sacramento (CW-150).

The results of the 1983 study (Engineering Science, 1983) indicated the presence of organic compounds (primarily chlorinated hydrocarbons) and trace metals in shallow wells on the base. They concluded that the shallow waterbearing zone (first waterbearing zone in the aquifer) was contaminated, particularly along the western border of the base. TCE concentrations along the western border ranged from 0.54 ug/L in MW-3 to 14,100 ug/L in MW-14. No sources could be readily identified for the contaminants measured in some wells. The levels of most contaminants in samples from the deeper waterbearing units were near or below the analytical limits of detection. Low levels of pesticides and herbicides generally less than 1 ug/L were detected in several on-base production wells including BW-2, BW-8, BW-11, BW-12, and monitoring wells MW-4, MW-7, MW-8, MW-9, MW-10, MW-13, MW-14, and MW-15.

## 3.1.3 Parameters of Storage, Use, and Disposal Sites

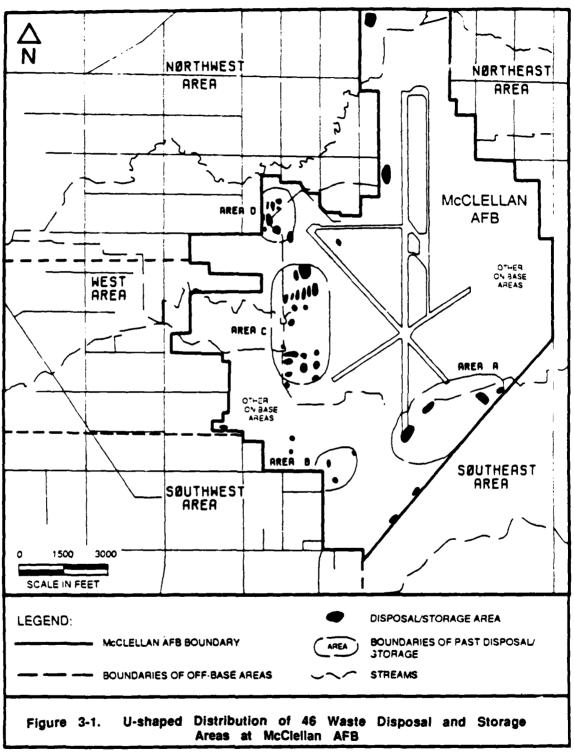
Facilities for storage and disposal of chemicals include drainage ditches, burn pits, landfills, buried leaky wastewater transfer lines, and

enclosed structures such as aircraft maintenance hangers, metal plating facilities, and storage warehouses.

Several parameters for each chemical storage, use, and disposal site are important in assessing the site's impact on contaminant migration. They are: the physical location and quantities of chemicals or wastes; the time interval over which a site was used; and the physical and chemical characteristics of the chemicals or wastes. Of the 154 previously identified potential sources of contaminants, 68 have been investigated sufficiently to determine parameters. For the remaining 86 PRLs, only the parameters of location and approximate time of usage are known with some level of confidence from aerial photographs. Investigations which will supply additional parameters are planned for the future.

Most of the PRLs occur near the periphery of McClellan AFB, because the center of the base is dominated by the busy aircraft runways and taxiways. Figure 3-1 illustrates the U-shaped distribution of 46 of the largest storage, use, and disposal sites. The sites are clustered in or near four areas (A, B, C, and D) designated in previous reports. The potential impact of contaminants on groundwater in each of the areas is discussed in Section 3.7.

In determining the distribution of contaminants beneath McClellan AFB, the physical parameters of location and content of each site are important because they affect the point of entry and depth of penetration for contaminants in the subsurface. Unless a chemical use, storage, or waste disposal area is underlain by natural or man-made impervious materials, contaminants will move into the vadose zone. Locations of potential contaminant sources are basically known for McClellan AFB. However, the content in terms of volume or types of materials is not well known. Travel



SOURCE: Modified from CH2M Hill, 1982.

time to groundwater depends on an understanding of other parameters described in following subsections. Without information on the quantity, type and time of release of materials deposited at potential release areas, the total impact of contaminant release from any one site cannot be determined.

The quantities and nature of contaminants and the depths of migration from PRLs will be better understood as planned site investigations under the preliminary pathways, groundwater pathways, and hydrogeologic assessments are conducted. Investigations of surface soils, site histories, surface water, soil vapor, surface flux and sediment will help to identify and quantify the contaminants of concern. Chemical and physical properties can then be determined and used to characterize contaminant migration.

## 3.2 <u>Chemical and Physical Parameters of Contaminants</u>

Based on historical use and disposal practices, potential human health risks, and compounds discovered in on-base and off-base groundwater wells, halogenated hydrocarbons, particularly TCE, are recognized as the principal contaminants of concern at McClellan AFB. Halogenated hydrocarbons are man-made organic compounds many of which are produced for use as degreasers and solvents. The halogenated hydrocarbons form a loose grouping of compounds, each of which is distinct in terms of structural formula, but which are similar in terms of density, solubility, viscosity, and volatility. For this and future groundwater investigations on McClellan AFB, the halogenated compounds of primary concern are chloroform (CHCl<sub>3</sub>), carbon tetrachloride (CHCl<sub>4</sub>), 1,1-dichloroethane (1,1-DCA), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethene (1,1-DCE), trichloroethene (TCE), tetrachloroethene (PCE), and any degradation products of those compounds.

Physical and chemical properties for concentrated and dilute forms of organic compounds have been calculated or measured in laboratories. The physical properties affecting migration from source to groundwater include quantity or volume, density, viscosity, adsorption, and partitioning between gas and liquid phases. In addition, solubility in water, degradation by

chemical or biogenic processes, reactions with other chemicals, and affinity for natural organic materials (sorption) are important properties that influence movement of contaminants. The importance of the properties or parameters in determining the migration of the organic compounds varies with the nature of the subsurface environment. Some properties play a greater role in the vadose zone, such as partitioning, and others play a greater role in the saturated zone, such as solubility. Table 3-1 lists the principal physical and chemical properties determined for the organic compounds detected in monitoring and water supply wells near McClellan AFB.

Physical and chemical properties influence migration of compounds upon leaving man-made containment. Solubility in water can immediately affect migration toward groundwater, if a compound is discharged with water or exposed to surface water (infiltrating or stormwater runoff). The compound will dissolve in water up to its limit of solubility, given enough time, and move in the subsurface along the migration path of surface water. Each of the compounds of concern at McClellan AFB are considered moderately soluble; they will dissolve in water over a range from 200 mg/L (for PCE) to 8,700 mg/L (for 1,2-DCA) at 20° C. Once in the aqueous phase, a given compound will tend to remain in solution and follow the migration path of water unless other factors change to decrease solubility. The quantity of a compound that cannot be dissolved in water will behave according to the properties of non-aqueous phases.

Halogenated hydrocarbons, including the group of compounds occurring at McClellan AFB, have densities greater than water. Undissolved fractions of a compound will tend to sink through a water body to form a separate chemical phase (Schwille, 1988). The sinking and density separation may occur in surface waters or within an aquifer. The densities of the compounds in Table 3-1 are 0.26 to 0.63 greater than that for water which is  $1.0 \text{ g/cm}^3$ .

In the vadose zone, the physical properties of contaminants affecting migration are viscosity, partitioning with respect to air, and adsorption on subsurface materials. Viscosity of liquids is the property which resists

TABLE 3-1. PHYSICAL AND CHEMICAL PROPERTIES OF DENSE CHLORINATED SOLVENT COMPOUNDS

Compound	Solubility (mg/L)	K (mL/g)	Density (g/cm <sup>2</sup> )	Dynamic Viscosity (Centipoise)	Henry's Law Constant (atm-m /mol)
Chloroform	8,200	44	1.49	0.56	0.0028
Carbon tetrachloride	785	439	1.59	0.97	0.023
1,1-Dichloroethane	5,500	30	1.17	0.50	0.0043
1,2-Dichloroethane	8,690	14	1.26	0.84	0.00091
1,1,1-Trichloroethane	720	152	1.35	0.84	0.013
1,1-Dichloroethene	400	65	1.22	0.36	0.021
cis-1,2-Dichloroethene	800		1.28	0.48	0.0029
trans-1,2-Dichloroethene	600	59	1.26	0.40	0.072
Trichloroethene	1,100	126	1.46	0.57	0.0071
Tetrachloroethene	200	364	1.63	0.90	0.0131

NOTE: Temperature of measurement is 20°C unless otherwise noted.

SOURCE: Schwille, 1984.

relative motion; the higher values of viscosity indicate greater resistance to flow in porous media. The viscosities of the organic compounds in Table 3-1 are less than the viscosity of water. Therefore, the pure or undissolved organic compounds have a greater tendency to flow through pores than does water under the same conditions and is important in the movement of contaminants into and through the unsaturated zone.

Partitioning of a volatile organic compound between liquid and air phases occurs in any environment where the compound is exposed to the air phase. This may occur in the surface environment and in the vadose zone beneath the site of discharge. Partitioning of volatile organics into the air phase may significantly affect the quantity of halogenated hydrocarbons that migrate through the unsaturated zone toward groundwater, because the compounds under conditions in the vadose zone may tend to volatilize. The Henry's Gas Law Constant in Table 3-1 is the parameter representing partitioning of compounds between air and water phases. The constants for the compounds of interest on the base vary over two orders of magnitude. The greater values of the constant indicate greater partitioning to the air phase.

Physical and chemical parameters of organic compounds that especially influence migration of contaminants in the saturated zone are those that affect solid/liquid partitioning of organic compounds. Sorption is the interaction that controls partitioning of an organic compound between solid phases and liquid (Freeze and Cherry, 1979), and is determined by the characteristics of the liquid phase and the solid phase. Sorption of organic compounds to naturally-occurring organic materials in the subsurface is proportional to the octanol-water partition coefficient  $K_{\text{OC}}$  (Karickhoff, 1984). Higher values of  $K_{\text{OC}}$  in Table 3-1 indicate a stronger attraction of a compound for natural organic particles or a higher degree of hydrophobility. Organic particle contents as low as 0.1 percent by volume may have a significant effect on the sorption of halogenated organic compounds. Sorption of organic contaminants on natural organic particles will slow or retard the

migration of contaminants with respect to groundwater migration velocity (Roberts, Goltz, and Mackay, 1986).

Sorption of organic compounds on non-organic particles is another interaction which may affect contaminant migration velocity. The sorption of organic compounds for non-organic mineral particles may be equal to or greater than the sorption on organic particles if the ratio of mineral surface area to organic particle content is large (Karickhoff, 1984; McCarty, Reinhard, and Rittman, 1981). Subsurface deposits with high clay or silt particle content may retard the velocity of organic compound migration. Although there have been few determinations of organic particle content of the sediments beneath McClellan AFB, laboratory measurements of organic content and grain size analysis of core samples will be made as part of the Groundwater Pathways Assessment.

Degradation of halogenated organic compounds is the alteration of the compound by chemical or biologically-assisted chemical processes. The dehalogenation or removal of chlorine or fluorine atoms may be accomplished chemically through oxidation or hydrolysis (Vogel and McCarty, 1987) or biologically through the activity of microorganisms (McCarty, Rittman, and Bouwer, 1984). Although the dehalogenation process is driven by chemical reaction or biologic activity, the net effect of the process is removal of halogen atoms, thereby altering the chemical character and potentially the migration pattern of the compound.

Dehalogenation as a result of biologic activity may occur in a step-wise manner in which one halogen atom is removed from an organic molecule structure (McCarty, 1986). The step-wise removal of chlorine from a compound such as PCE could alter it first to TCE, to 1,2-DCE, and then to vinyl chloride. One step in the dehalogenation process may take a number of years to become apparent as detectable concentrations of organic compounds in groundwater, and not all of the quantity of one compound may be dehalogenated simultaneously. Therefore, a quantity of PCE discharged in groundwater may result over 30 years in detectable concentrations of the original compound and

several of its dehalogenated "daughter" products. Dehalogenation beneath McClellan AFB is indicated by the presence of PCE, TCE, 1,2-DCE, and vinyl chloride in groundwater monitoring wells in the same areas.

#### 3.3 Parameters in the Vadose Zone

Beneath the potential contaminant discharge points of known waste disposal sites and PRLs lies a 90 to 100 foot thick unsaturated zone. The vadose zone beneath McClellan AFB consists of interbedded, alluvial sands, silts, and clays of the Victor and Fair Oaks formations. Deposits in the formations were laid down in a fluvial environment. Fluvial deposition in the Victor and Fair Oaks formations is characterized by gravel and sand filling paleochannels which are long but narrow. Available lithologic data also suggest that the paleochannels migrated laterally and vertically with time. Between the channels, silty to clayey overbank deposits, interfinger with flood-deposited sands and increase in clay content with distance from the channels. Fluvial-interfluvial deposits of the kind recognized beneath McClellan AFB are heterogeneous in their grain size distribution and in their permeabilities.

Permeability, which is the ability of porous medium to allow fluid flow, is an important parameter for determining the pathway for chemical compounds or water from the ground surface. Heterogeneity in permeability results from the processes in which deposits were laid down. Permeability, sometimes termed intrinsic permeability, is the major factor in the calculation of the hydraulic conductivity (K), used in the Darcy equation for groundwater flow. Hydraulic conductivity values characterize the ability of a porous medium to allow flow of a fluid with specific density and viscosity characteristics (Freeze and Cherry, 1979).

Although vertical conductivities primarily affect contaminant migration through the unsaturated zone, other physical parameters are also important. Infiltration of surface water, water content and distribution, capillarity, and soil-air-liquid exchanges also affect movement of liquid

contaminants through the vadose zone. However, these parameters cannot be quantified with the available data, but properties of the unsaturated zone will be better characterized from site and pathways investigations.

#### 3.4 Parameters in the Saturated Zone

The saturated zone beneath McClellan AFB lies at a depth of 90 to 100 feet below ground surface where all void spaces in the deposits of the Fair Oaks Formation or the interfingering, contemporaneous Laguna Formation are filled with groundwater. Deposits of these formations have a thickness of approximately 325 feet and occur between depths of 50 and 400 feet below ground surface. All monitoring well samples in which contaminants have been detected are screened within one of these formations. Therefore, the physical properties of these formations play a significant role in determining the contaminant migration velocities in the saturated zone beneath McClellan AFB.

The Fair Oaks and Laguna formations were deposited in the same time interval and under generally similar depositional conditions. As a result of the depositional processes, the deposits in the formations are heterogeneous horizontally and vertically. The nature of the heterogeneity was described in Section 3.3 for the vadose zone. As in the vadose zone, horizontal and vertical variations in grain size distribution result in permeability differences. In the vadose zone, vertical conductivity variations are of primary importance due to the strong gravitational flow component. Horizontal hydraulic conductivity is also an important saturated flow parameter because groundwater has a significant horizontal flow component.

Within porous saturated deposits, hydraulic conductivity (K) may vary in direction and place, as in the heterogeneous deposits beneath McClellan AFB. Variations in K throughout a deposit determine, in part, velocity of groundwater or contaminant flow. Horizontal hydraulic conductivity values have been determined from aquifer tests conducted in several widely-spaced areas of McClellan AFB. The values range from 4.2 to 500 gallons per

day per square foot of aquifer (gpd/ft<sup>2</sup>). The values and sources of data are listed in Table 3.2.

Vertical hydraulic conductivity for deposits beneath McClellan AFB have indirectly characterized from two different aquifer tests. Vertical K values probably vary over a range at least as large as that for horizontal K values. In many aquifers, vertical conductivity is 10 to 100 times less than horizontal conductivity (Freeze and Cherry, 1979). Vertical conductivities which are 0.1 to 0.01 of horizontal conductivities result from the deposition of laterally continuous beds of sorted particles with finer particles concentrated near the top or the bottom. Relatively low conductivities impede vertical flow of groundwater. Because laterally extensive sorted beds are not typical of the saturated zone beneath the base, vertical hydraulic conductivity locally may be similar or equal to horizontal conductivity. Therefore, groundwater containing contaminants may flow vertically from shallow zones to deeper zones.

In addition to hydraulic conductivity, a significant parameter in determining contaminant migration is hydraulic gradient. Hydraulic gradient as indicated by differences in total hydraulic head determines the potential direction for groundwater flow. In an unpumped aquifer, groundwater flow may follow surface topographic features of a region. Groundwater is pumped from several depths on and near the base, and steep gradients are induced near pumped wells. Previous studies by Bloyd (1978) and Papadopulus and Associates (1986) report that groundwater flow directions have changed from westerly to southwesterly in response to groundwater withdrawals. Within the boundaries of the base, groundwater gradients vary from place to place in response to pumping for groundwater supply (for example, base production well 18) or groundwater remediation (Area D extraction wells).

Changes in groundwater gradients occurring since the disposal of contaminants began at McClellan AFB affect the direction of contaminant migration. Contaminants that have reached the upper groundwater zone over the last 30 years have probably moved with groundwater along flow paths determined

TABLE 3-2. SUMMARY OF AQUIFER TEST RESUL PORTED BY RADIAN AND OTHER CONTRACTORS

	Monitorio	Transmissivity (gpd/ft)	[gpd/ft]	Hydraulic Conductivity (gpd/ft <sup>2</sup> )	nductivity ft]	Storativity [x10 4	[x10 <sup>-4</sup> ]
Contractor	Zone	Range	Average	Range	Average	Range	Average
Radian	Middle	7,700 - 8,600	8,000	260 - 290	270	1.3 - 6.2	3.0
(Area C)	Deep	7,600 - 15,000	12,000	250 - 500	380	1.6 - 0.87	1.6
CHEM HILL	Shallow	17,500 - 28,600	16,525	œ.	NA (725) <sup>b</sup>	9.0 - 82.0	40 a
(Area D)	Middle	2,300 - 19,300	8,850	N.	NR (315) <sup>b</sup>	3.0 - 11.0	0.8
McLeren (Area D)	Shallow, Middle & Deep	6,851 - 19,110	12,000	RN	W.	5.0 - 91.0	90
Engineering-Science (Area C)	Shal Low	21 (one value reported)	21	4 G	4.	æ	ĸ ĸ
McLaren (Area C)	Middle	1,200 - 1,900		97 - 120	109	Q	
EG&G Idaho, Inc. [Area C]	Middle	13,750 - 3,000	2,500	RN	NR (83) <sup>b</sup>	QN	

Specific yield not reported for unconfined condition in shellow monitor zone.

"Hydrogeologic Evaluation of Area D McClellan AFB, California" IRP Phase IIVIV CH\_M Hill, August 1984. Tech Memo Number 3. SOURCE:

Engineering-Science, 1983. "Final Report, Installation Restoration Program, Phase II - Confirmation, McClellan AFB, California," Engineering-Science, Arcadia, California,

Testing of Initial Extraction Well and System Confirmation by Computer Modeling," prepared by McLaren Environmental "Area D Monitoring/Extraction System, Technical Report No. 2, Engineering, Sacramento, California, for McClellan AFB, Sacramento, California, Contract No. F04699-85-60020. McLaren Environmental Engineering, January 1986a.

EG & G Idaho, Inc. "Hydrogeologic Assessment Report for the Surface Impoundment, Area "C", McClellan Air Force Base, Sacramento, California, "Project Number PRJY871509. December 1987. Radian Corporation, 1986. "Installation Restoration Program, McClellan AFB, California, Phase II, Monitoring Well Installation, Stage 2-2", 3 Volume.

# MCSEMIAN/090888/HMM

Hydraulic conductivity estimated by Radian based on reported transmissivity value and aquifer thickness.

NR = Not reported.

ND = Not determi..ed.

by gradients induced by groundwater withdrawal. Some on-base and off-base wells have started pumping after a time when contaminants could have entered the groundwater. The direction of contaminant movement in some areas may have changed more than once in response to pumping of water supply wells. Because widespread groundwater monitoring to trace contaminant distribution has begun very recently, the migration paths followed by contaminants under historic gradients cannot be determined accurately. Therefore, hydrogeologic and site history data should be collected during future site investigations and pathway studies to characterize present flow paths and to evaluate possible remediation measures.

Dispersion and seasonal variations in groundwater levels also have an impact on the concentration of contaminants. Dispersion is the spreading and mixing of contaminants in directions both along and normal to the general direction of groundwater flow. Factors contributing to dispersion include aquifer heterogeneities, mixing due to variations in groundwater velocities in and between pores, and molecular diffusion (Freeze and Cherry, 1979). These properties result in contaminants spreading over a larger volume of the saturated zone than would be caused by mechanical transport by flowing groundwater. Dispersivity values for a contaminant in a saturated zone may have different values for the direction parallel to groundwater flow and the direction transverse to the direction of flow. The net result of dispersion is the lowering of contaminant concentrations by dilution. Dispersivity values are scale dependent and thus are not readily measured. Dispersivity for a specific area can be determined through field tests.

Seasonal variations in water elevations for the saturated zone may reflect two different effects on contaminant concentrations in groundwater. An increase in water levels during or following the wetter winter months of the year may cause a decrease in contaminant concentrations at some wells due to dilution of the concentration of contaminant by the increased volume of uncontaminated water. On the other hand, contaminant concentrations may increase locally in wetter seasons because infiltrating rainfall or losses from surface streams, due to greater runoff, may "flush" contaminants into the

saturated zone from pore spaces in the vadose zone where they have been held during dry seasons. Although the extent of these opposing effects cannot be fully evaluated for McClellan AFB because of local variations in the vadose zone, seasonal changes in contaminant concentrations of monitoring wells can be assessed with a data base that includes enough quarterly data.

#### 3.5 Chronologic Parameters

The principal time-related factors affecting contaminant distribution in groundwater beneath McClellan AFB are the time of contaminant release, travel time through the vadose zone, and travel time in the saturated zone toward a water supply or monitoring well.

The time interval of contaminant releases from PRLs may be estimated from historic data and aerial photographs of the base. Specific dates or years of contaminant release cannot be determined from the data, but a range of five years before or after the time of release may be estimated.

The travel time through the vadose zone depends on the physical characteristics of the medium, rainfall infiltration, and the characteristics of the contaminants as discussed above. Future planned site investigations of PRLs shall yield data for this type of analysis.

The travel time for a contaminant depends not only on when contaminants reach the groundwater but also on the variations in groundwater flow directions over time. Once in the groundwater, contaminants tend to follow groundwater flow directions that are locally affected by withdrawals from water supply wells. In the period that contaminants may have reached and begun to migrate with groundwater, new on-base and off-base water supply wells have been installed. Pumping of various water supply wells, both on- and off-base have changed hydraulic gradients locally. Therefore, a contaminant moving in one direction in groundwater 20 years ago, for example, may have changed direction ten years ago due to the change in gradient induced by a new

well. This change in flow direction complicates the tracking of contaminant migration pathways.

## 3.6 <u>Distribution of Contaminants</u>

The previous sections describe the physical parameters that influence movement of contaminants and groundwater beneath McClellan AFB. The principal purpose for defining and quantifying the parameters is to estimate the distribution of contaminants throughout the groundwater domain beneath the base and nearby areas. Based on this understanding, potential degradation of groundwater supplies and methods to remediate the degradation may be addressed. As discussed above in the previous sections, a number of important parameters are not yet sufficiently known to estimate contaminant distribution. The ongoing RI/FS activities including the Quarterly Sampling and Analysis Program, the Hydrogeologic Assessment for McClellan AFB, and Pathways studies may provide more information on the nature and relative volume of contaminants, distribution of contaminants in the groundwater, surface soils and underlying deposits, effects of water supply wells, and timing of potential releases.

Contaminant distribution in any specific area is characterized by the volume of the saturated zone through which contaminants have spread from one or more sources. The volume affected is determined by the lateral and vertical distances over which contaminants have been transported. Travel distance is ultimately determined by product of velocity (speed and direction) and travel time. The distribution of contaminants in the groundwater beneath McClellan AFB cannot be quantitatively predicted at this time because the parameters affecting speed of travel (for example, effective porosity, horizontal and vertical hydraulic conductivities, retardation caused by sorption, hydraulic gradients, and direction of travel (flow direction, permeability), and travel time through the vadose zone are not accurately known. Therefore, estimation of contaminant distribution depends on the distribution monitoring wells, the ability of analytical techniques to detect

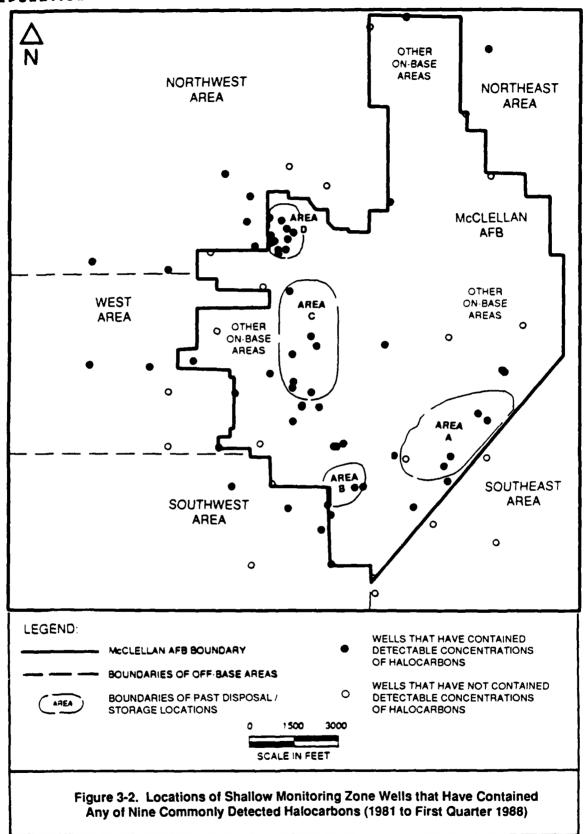
contaminants in samples, and the use of analytical techniques to interpret sample results and hydrogeologic information.

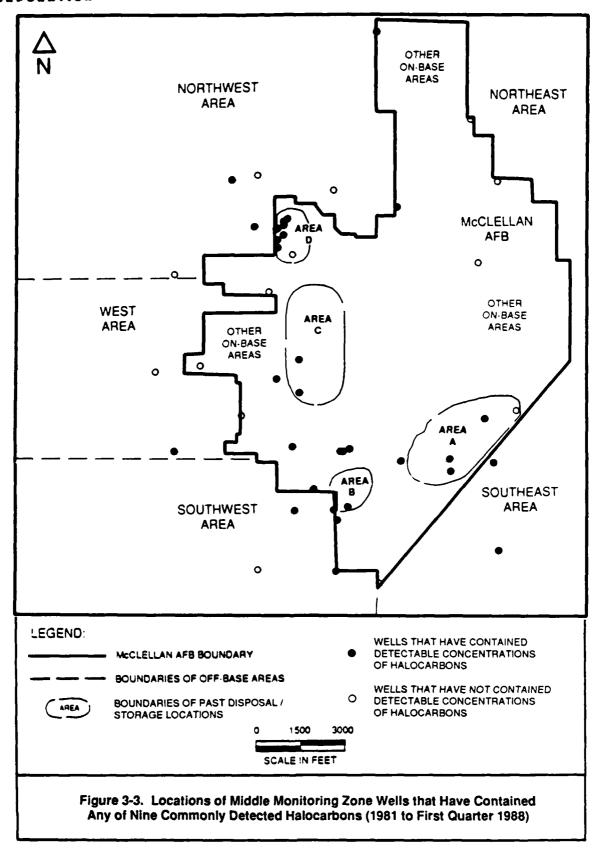
The McClellan AFB Quarterly Sampling and Analysis Program is the investigative method available to determine the distribution of contaminants in groundwater. The following subsections describe the efforts to define contaminant distribution on the basis of data compiled from the program.

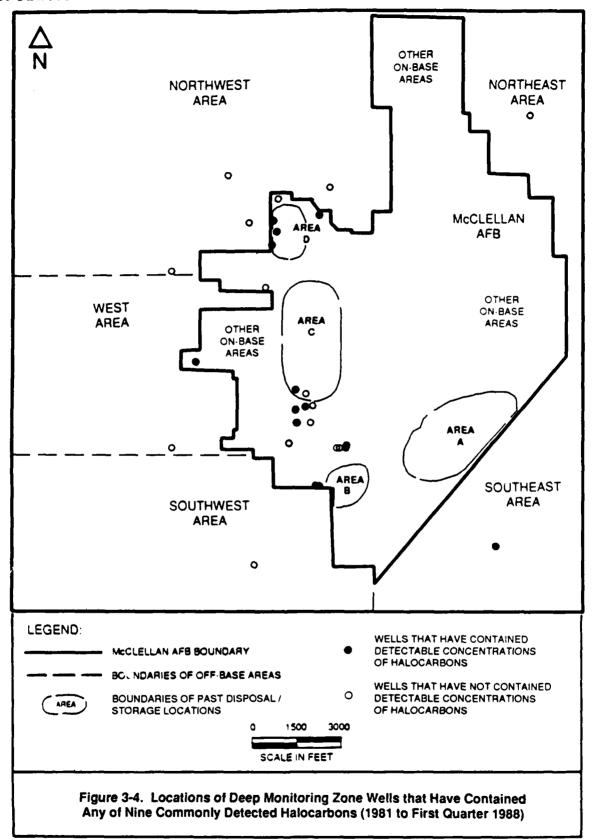
#### 3.7 Distribution and Migration of Contaminants by Area

The following discussion of contaminant distribution and migration is based primarily on sampling results from monitoring wells located on and off base. In addition, other factors that may have influenced contaminant distribution are also considered. Figures 3-2, 3-3, and 3-4 show the location of shallow, middle, and deep zone monitoring wells that have contained any of nine contaminants (1,1-DCE, 1,1-DCA, TCE, vinyl chloride, chloroform, 1,2-DCA, 1,1,1-TCA, carbon tetrachloride, and tetrachloroethene). These figures were generated from analytical data collected during the period from 1981 through the First Quarter 1988 from all monitoring wells. Monitoring wells are not uniformly distributed across the McClellan AFB study area but are clustered primarily in and around Area D and the south end of Area C. As shown in Figure 3-2, contamination in the shallow monitoring zone has predominantly been detected in on-base Areas A, B, C and D and off-base in the Southwest, the Northwest, and the West Areas. Middle zone contamination, as shown in Figure 3-4, is similar to the shallow monitoring zone. Contaminants in the deep monitoring zone have been detected in Areas B, C and D but there are no wells in Area A. Radian has recommended that additional wells be installed in and around Areas A and B to determine water quality.

Analyses of groundwater samples collected from the wells across the base have indicated the presence of a variety of contaminants. During the First Quarter 1988, TCE was detected in Area A, Area B, Area C, Area D, the Northwest Area, the West Area and the Southwest Area. Detected concentrations of chlorinated solvents and several metals (chromium and lead) were at or





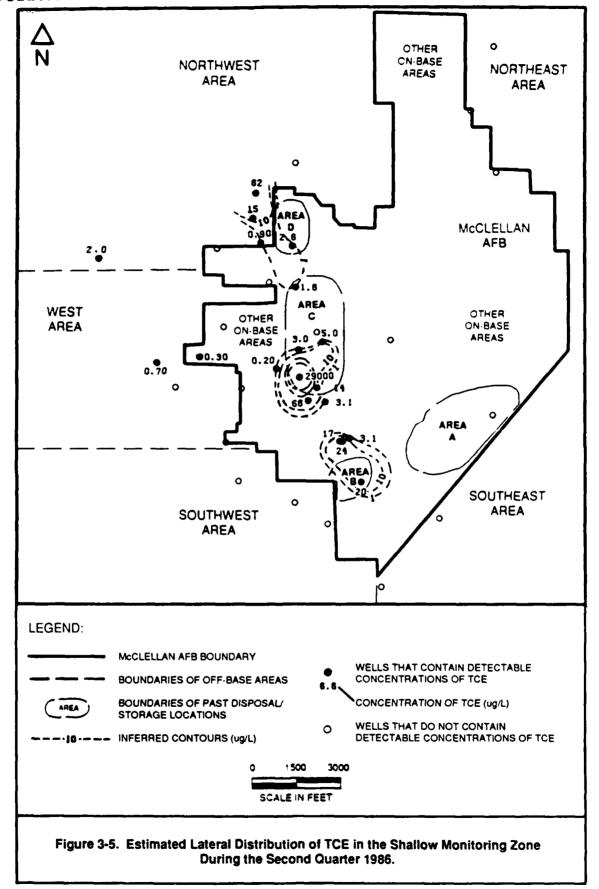


above the California Department of Health Services (DOHS) action levels and/or U.S. EPA Primary Maximum Contaminant Levels for drinking water in 30 wells (First Quarter 1988). Concentrations of chlorinated solvents measured in monitoring wells in Areas C and D have been generally higher than those measured in other areas. Chlorinated solvents have been repeatedly detected in samples from most of the on-base monitoring wells as shown in Figure 3-2, 3-3, and 3-4.

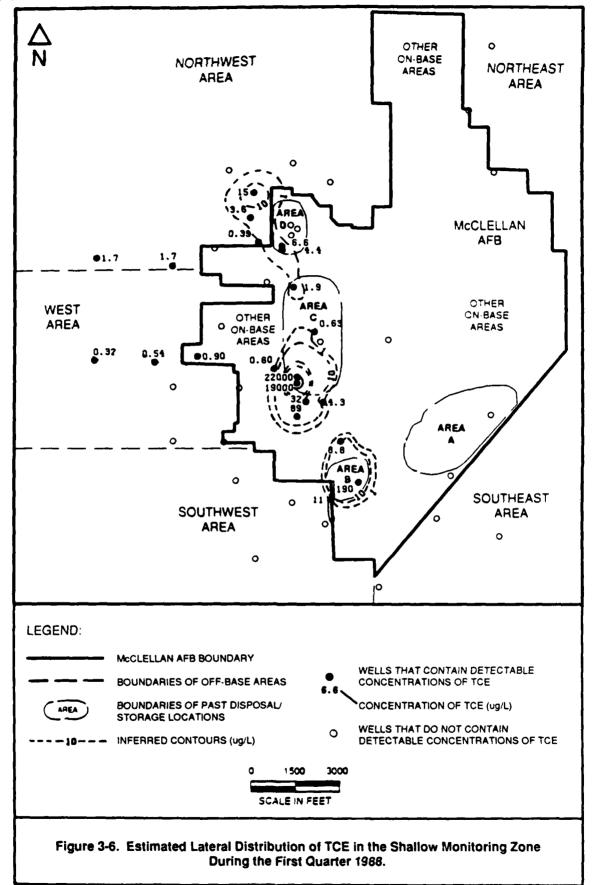
In order to evaluate the migration of contaminants with respect to time, analytical data were segregated into sets by date of sample collection and groundwater monitoring zone designation. Quarterly data from the Second Quarter 1985 to the First Quarter 1988 were plotted and some contouring of TCE concentrations was attempted. Comparisons over a longer time period could not be made due to the lack of consistent sampling data. Preceding data from 1979 to 1985 was not included because wells were not sampled at regular intervals and because the results are from other USAF contractors and other laboratorics. Radian has not evaluated QA/QC procedures used by these other contractors and, therefore, cannot use this data quantitatively with confidence.

The present pattern of contaminants as detected in monitoring wells on and off-base indicates that there has been horizontal movement probably in the direction of groundwater flow. This horizontal migration, however, is occurring at a slow rate. In Area C (based on a horizontal hydraulic gradient of 0.001 ft/ft, a K of 275 gpd/ft<sup>2</sup> (Radian, 1988) and an effective porosity (n) of 0.40, groundwater velocity is estimated to be 33 feet per year.

Figures 3-5 and 3-6 show TCE concentrations in shallow zone monitoring wells and estimated contours of TCE concentrations during the Second Quarter 1986 and the First Quarter 1988. The contours on these figures are not meant to depict actual contaminant plumes or edges of detectable TCE concentrations. These contours are based on analytical results from the existing monitoring wells; sampling points outside these contours may show different contaminant patterns. Comparison of the two figures shows no major







3-25

changes in contaminant levels over the two year period. Most of the monitoring wells that are common to both figures are located in Area C.

In areas where horizontal gradients are steeper due to removal of groundwater, there are some indications of more rapid horizontal migration of contaminants. Shallow zone monitoring wells in and around Area D have shown a decreasing trend since the extraction system was put into operation. Two off-base wells, MW-1004 and MW-1005, have shown decreases in TCE concentration that are probably due to the operation of the Area D extraction system. A time period longer than a year is needed to determine if the decreasing contaminant level is a consistent trend.

Cross sections were prepared in Areas B, C, and D in an attempt to evaluate the vertical extent of contamination and lateral contaminant migration with respect to time. Although the cross sections allow graphical presentation of concentrations of contaminants in two dimensions, trends are not recognizable because contaminant migration appears to be slow and the period of analytical data is small. Therefore, because the cross sections do not show any apparent trends over time, they were not included in this report.

The following subsections present, by area, available information on the historical horizontal and vertical extent of TCE as detected in monitoring wells, the status of monitoring wells within or adjacent to each area, and information on potential contributors (confirmed sites and unstudied and partially studied potential release locations) to the observed groundwater contamination. The focus of the discussions is on TCE, because this compound has been detected most frequently and most consistently in on- and off-base wells. A summary of maximum concentrations of TCE, vinyl chloride, 1,1-DCE, 1.1-DCA. 1,1,1-TCA, chloroform. 1,2-DCA. carbon tetrachloride, tetrachloroethene detected in monitoring wells since 1985 is presented in Table 3-3. Based on the sampling variability observed for three compounds in Section 4, one can assume that these values are accurate to within + 40 percent. A historical summary of individual wells that have contained these contaminants is included in Appendix B. This appendix contains data that has



TABLE 3-3. RANGES IN CONCENTRATIONS FOR COMMONLY DETECTED ANALYTES a IN MONITORING WELLS FROM 1985 TO 1988, McCLELLAN AFB

Groundwater Area Monitoring			~	Range of Detectable Concentrations(ug/L)	
Area esignation	Zone	Analyte	Minimum	Maximum	
A	Shallow	1,1-Dichloroethene	0.40	0.40	
		Chloroform	3.7	40	
		1,2-Dichloroethane	0.20	5.3	
		1,1,1-Trichloroethane	0.30	6.5	
		Trichloroethene	2.4	190	
	Middle	1,1-Dichloroethene	0.10	3.8	
		1,1-Dichloroethane	2.6	2.6	
		Chloroform	0.10	15	
		1,2-Dichloroethane	0.41	0.74	
		1,1,1-Trichloroethane	2.6	2.6	
		Carbon tetrachloride	5.1	27	
		Trichloroethene	0.65	195	
	Deep	(There are currently no deep z	one wells in Area	A)	
В	Shallow	1,1-Dichloroethane	0.21	0.21	
		Chloroform	0.20	2.5	
		1,2-Dichloroethane	0.19	2.1	
		1,1,1-Trichloroethane	2.3	2.3	
		Carbon tetrachloride	0.25	0.71	
		Trichloroethene	2.7	190	
		Tetrachloroethene	0.18	6.2	
	Middle	Chloroform	0.95	5.6	
		1,1,1-Trichloroethane	0.48	0.50	
		Trichloroethene	0.20	86.2	
	Deep	1,1-Dichloroethene	0.24	0.76	
		1,1-Dichloroethane	0.15	0.15	
		Chloroform	0.13	0.90	
		1,2-Dichloroethane	0.40	0.90	
		Trichloroethene	1.3	210	
		Tetrachloroethene	0.15	0.15	
С	Shallow	Vinyl chloride	0.60	15	
		1,1-Dichloroethene	0.24	8.5	
		1,1-Dichloroethane	0.18	10	
		Chloroform	0.10	58	
		1,2-Dichloroethane	0.12	140	
		1,1,1-Trichloroethane	0.24	280	
		Carbon tetrachloride	0.31	22	
		Trichloroethene	0.20	68000	
		Tetrachloroethene	0.12	23	

a Analytes included are Vinyl chloride, 1,1-Dichloroethene, 1,1-Dichloroethane, Chloroform, 1,2-Dichloroethane, 1,1,1-Trichloroethane, Carbon tetrachloride, Trichloroethene and Tetrachloroethene



Table 3-3. (Continued)

	Groundwater		Kange of	Range of Detectable		
Area	Monitoring		Concentra	tions(ug/L		
esignation	Zone	Analyte	Minimum	Maximum		
С	Middle	Chloroform	0.96	0.96		
		1,2-Dichloroethane	0.74	0.74		
		Trichloroethene	0.80	610		
	Deep	1,1-Dichloroethene	1.2	297		
		1,1-Dichloroethane	0.15	16.7		
		Chloroform	0.21	0.43		
		1,1,1-Trichloroethane	0.61	133		
		Trichloroethene	1.1	350		
		Tetrachloroethene	13.5	13.5		
D	Shallow	Vinyl chloride	810	810		
		1,1-Dichloroethene	0.21	64300		
		1,1-Dichloroethane	0.19	3560		
		Chloroform	2320	2320		
		1,2-Dichloroethane	94.7	2790		
		1,1,1-Trichloroethane	21	22800		
		Trichloroethene	2.6	26600		
		Tetrachloroethene	64.9	2480		
	Middle	Vinyl chloride	0.34	2230		
		1,1-Dichloroethene	0.25	11500		
		1,1-Dichloroethane	2.6	4430		
		Chloroform	0.57	3.2		
		1,2-Dichtoroethane	0.16	300		
		1,1,1-Trichloroethane	0.30	1870		
		Trichloroethene	0.58	1200		
		Tetrachloroethene	0.16	260		
	Deep	Vinyl chloride	1.3	1.3		
		1,1-Dichloroethene	0.27	270		
		1,1-Dichloroethane	0.13	2.0		
		Chloroform	0.85	0.85		
		1,1,1-Trichloroethane	0.21	19		
		Trichloroethene	0.62	290		
		Tetrachloroethene	0.10	0.10		
OTHER	Shallow	1,1-Dichloroethane	0.20	1.1		
		Chloroform	0.10	0.12		
		Trichloroethene	, 0.70	1.1		
		Tetrachloroethene	0.12	0.47		
	Middle	1,1-Dichloroethene	0.32	0.32		
		1,1-Dichloroethane	0.13	0.13		
		Chloroform	0.10	0.40		
		Trichloroethene	0.39	0.39		



Table 3-3. (Continued)

	Groundwater		Range of I	Detectable
Area	Monitoring		_	tions(ug/L)
Designation	Zone	Analyte	Minimum	Maximum
NORTHEAST	Shallow	1,1,1-Trichloroethane	0.20	0.28
	Middle	(There are currently no middle zone w	ells in the	Northeast Area
	Deep	(No Analytes Detected)		
NORTHWEST	Shallow	Vinyl chloride	0.41	0.43
		1,1-Dichloroethene	0.10	280
		1,1-Dichloroethane	0.40	41
		Chloroform	0.10	2.8
		1,2-Dichloroethane	0.40	14
		1,1,1-Trichloroethane	0.20	16
		Trichloroethene	0.32	100
		Tetrachloroethene	0.10	1.2
	Middle	1,1-Dichloroethene	0.16	0.16
		Carbon tetrachloride	0.20	0.20
		Trichloroethene	0.41	0.41
	Deep	(No Analytes Detected)		
₩EST	Shallow	Chloroform	0.10	0.17
		Trichloroethene	0.25	1.7
	Middle	Tetrachloroethene	0.20	0.20
	Deep	(No Analytes Detected)		
SOUTHWEST	Shallow	Chloroform	0.11	0.33
		1,1,1-Trichloroethane	0.25	0.78
		Trichloroethene	0.30	57
		Tetrachloroethene	0.16	5.6
	Middle	Chloroform	0.12	0.49
		1,1,1-Trichtoroethane	0.83	0.83
		Trichloroethene	0.30	21
		Tetrachloroethene	0.10	1.0
	Deep	(No Analytes Detected)		
SOUTHEAST	Shallow	(No Analytes Detected)	,	
	Middle	1,1-Dichloroethene	6.5	6.5
		1,1-Dichloroethane	0.17	0.19
		1,1,1-Trichloroethane	2.5	2.5
		Trichloroethene	1.4	8.9
	Deep	1,1-Dichloroethene	0.75	0.75

been validated by Radian using established QA/QC procedures (Fourth Quarter 1985 to the present) and historical unvalidated data for samples collected from other USAF contractors since 1981. In addition, the locations of monitoring wells, base production wells, and water supply wells are shown on Plate 1, located at the back of this report.

#### Area A and Adjacent On-Base Areas, and the Southeast Area

There are 15 monitoring wells located in Area A and Adjacent On-Base Areas and 7 located in the Southeast Area. These include 11 network wells, 2 non-network wells, and 9 dry wells (Tables 3-4 and 3-5). Fourteen of these wells are screened in the shallow monitoring zone, seven are screened in the middle monitoring zone, and one is screened in the deep monitoring zone.

Area A is the first area where groundwater contamination was recorded on McClellan AFB. In 1956, base production well BW-7 (constructed in 1942) was taken out of service due to contamination by unspecified hydrocarbons and phenols. This well was abandoned (destroyed) in the 1970s. In 1979, TCE was detected in base production wells BW-1 and BW-2 at concentrations above drinking water standards. These wells were subsequently taken out of service. In 1980, BW-12 was taken out of service for the same reasons. A historical summary of base production well operation and analytical data are presented in Appendix C.

Based on the distribution of monitoring wells, contamination in the shallow monitoring zone appears to be the most extensive. TCE has been found in seven on-base shallow zone monitoring wells in Area A, five of which are now dry. TCE has not been detected in the off-base shallow zone monitoring wells. Of the seven middle zone monitoring wells, TCE has been detected in every well except MW-71. In addition, carbon tetrachloride has been consistently detected in MW-27D since the Third Quarter 1987. The detected concentrations of carbon tetrachloride have been above the drinking water standard of 5.0 ug/L for the past four quarters. A summary table showing concentrations of TCE and other commonly detected halocarbons is included in Appendix B. Although the sampling of local base production wells has indicated that

TABLE 3-4. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN AREA A AND ADJACENT ON-BASE AREAS

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells <sup>C</sup>	Total Number of Wells
Shallow	MW-67 MW-68	None	MW-8b MW-9b MW-25sb MW-26sb MW-27sb MW-39s MW-40sb MW-46sb	10
Middle	MW-27P <sup>b</sup> MW-69 MW-71	MW-25D <sup>a,b</sup> MW-26D <sup>b</sup>	None	5
Deep	None	None	None	0
Total Number of Wells	5	2	8	15

<sup>&</sup>lt;sup>a</sup> Water level is measured monthly in this well.

b Samples collected from these wells have contained TCE.

c Based on recent inspections by Radian, the Air Force is currently evaluating recommendations for well abandonment (destruction).

TABLE 3-5. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN THE SOUTHEAST AREA

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells <sup>b</sup>	Total Number of Wells
Shallow	MW-1013 MW-1014 MW-1037	None	MW - 28S	4
Middle	MW-28D <sup>a</sup> MW-1038 <sup>a</sup>	None	None	2
Deep	MW-1039	None	None	1
Total Number of Wells	6	0	1	7

Based on recent inspections by Radian, the Air Force is currently evaluating recommendations for well abandonment (destruction).

groundwater contamination may exist at depths, there are no existing deep zone monitoring wells in this area. The one deep zone monitoring well present is MW-1039, located off-base in the Southeast Area. TCE has not been detected in this well. Additional deep zone monitoring wells have been recommended to be installed as part of the Hydrogeologic Assessment Report currently being prepared for McClellan AFB. These recommendations are being reviewed by the USAF.

Currently, in Area A and Adjacent On-Base Areas, there are 48 uninvestigated potential release locations (UPRLs), 4 partially studied potential release locations (PSPRLs), and one confirmed site (38). A summary table for these data is included in Appendix A.

Another limitation on interpreting the analytical results are the changes that have occurred in the local flow regime due to the pumping schedules of the base production wells. Six base production wells (BW-1, BW-2, BW-7, BW-10, BW-12, and BW-13) in the eastern and southern portions of the base may have influenced groundwater flow directions in Area A. Of these six wells, BW-10 and BW-13 are the only wells still in service. BW-10 and BW-13 have been in operation since 1945. BW-13 has operated on an intermittent basis since 1987 due to the presence of carbon tetrachloride and is shut down whenever carbon tetrachloride levels are detected above drinking water standards.

Continued operation of BW-10 and BW-13 has had a dominant influence on groundwater flow in Area A and Adjacent On-Base Areas. These influences will change depending on the operating schedules of BW-10 and BW-13. Water supply wells located south of Area A are also factors to be considered (Plate 1).

Based on the limited number of available wells, groundwater within and south of Area A appears to be flowing to the southwest. Carbon tetrachloride has been detected in MW-27D, MW-41S, and BW-13 along this flow path. Carbon tetrachloride may be a good indicator compound to assess contaminant

migration from Area A. Based on the occurrence of carbon tetrachloride in these three Area A wells, it may be possible that this compound is emanating from Area A and is flowing toward base production wells BW-13 and BW-18. Sampling of existing wells (MW-25D and MW-26D) and installation and sampling of additional monitoring wells in this area may confirm this possibility.

The absence of wells north of Area A does not allow for determination of groundwater flow or water quality. Monitoring well MW-49S will be sampled during the Third Quarter 1988 to evaluate the current water quality in this area. Although it is though that groundwater is flowing toward active base production well BW-10, the location of the groundwater divide in or north of Area A cannot be specified.

of the areas on McClellan AFB that have been identified as containing numerous storage and disposal sites, Area A is the least characterized, and hence, the least understood. Radian has recommended in the Hydrogeologic Assessment Workplan for McClellan AFB that additional shallow, middle, and deep zone monitoring wells similar in depth to wells installed by EG&G in Area C be installed in the local area by 1989. Analytical data collected from these wells in the future will assist in characterizing groundwater contaminant distribution and migration from Area A.

#### Area B and Adjacent On-Base Areas and the Southwest Area

There are 21 monitoring wells located in Area B and Adjacent On-Base Areas, and 10 monitoring wells located in the Southwest Area. These include 18 network wells, 12 non-network wells, and 6 dry wells (Tables 3-6 and 3-7). Twelve of these wells are screened in the shallow monitoring zone, 10 are screened in the middle monitoring zone, and 9 are screened in the deep monitoring zone. There are three well clusters in these areas, including MW-120/MW-121/MW-122, MW-1021/MW-1022 and MW-1000/MW-1020.

Water quality problems were initially identified in 1979 when TCE was detected in BW-18. Currently, the well is operating with a wellhead water

TABLE 3-6. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN AREA B AND ADJACENT ON-BASE AREAS

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells	Total Number of Wells
Shallow	MW-41S <sup>a</sup> MW-117 <sup>a</sup> MW-120 <sup>a</sup>	MW-7 <sup>a</sup> MW-65 <sup>a</sup> MW-123 <sup>a</sup>	MW-23S <sup>a, c</sup>	7
Middle	MW-23D MW-121	MW-5 MW-6 <sup>a</sup> MW-118 <sup>a</sup> MW-124 <sup>a</sup>	None	6
Deep	MW-63 <sup>a</sup> MW-122 MW-132 <sup>a</sup>	MW-64 MW-66 MW-119 MW-125 MW-127 <sup>a</sup>	None	8
Total Number of Wells	8	12	1	21

a Samples collected from this wells have contained TCE. Water level is measured monthly in this well.

Based on recent inspections by Radian, the Air Force is currently evaluating recommendations for well abandonment (destruction).

TABLE 3-7. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN THE SOUTHWEST AREA

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells	Total Number of Wells
Shallow	MW-1011 MW-1016 MW-1020 <sup>a</sup> MW-1021 <sup>a</sup> MW-1023	None	None	5
Middle	MW-1000 MW-1015 MW-1022 <sup>a</sup> MW-1024	None	None	4
Deep	MW-1025	None	None	1
Total Number of Wells	10	0	0	10

 $<sup>^{\</sup>rm a}$  Samples collected from these wells have contained TCE.

treatment unit. In the Southwest Area, two private wells and one Sacramento city well (CW-150) were closed due to TCE contamination.

TCE has been detected in 9 shallow zone monitoring wells. One of these wells is now dry (MW-23S) and one is located off-base in the Southwest Area (MW-1021). Samples collected from four middle zone monitoring wells and three deep zone monitoring wells have also contained TCE. Table 3-3 shows the maximum concentrations of TCE and other chlorinated hydrocarbons detected within each of the three groundwater monitoring zones.

The 18 monitoring wells that are part of the network have been sampled on a quarterly basis since the Fourth Quarter 1986. The concentrations of TCE detected in three of the shallow zone monitoring wells and two of the deep zone monitoring wells have been consistently above drinking water standards since the Fourth Quarter 1986. TCE has been consistently detected in two of the middle zone monitoring wells and drinking water standards have been exceeded in one of these wells in five of the past six quarters. A summary table showing historical concentrations of TCE and other commonly detected contaminants is presented in Appendix B.

In Area B and Adjacent On-Base Areas, there are 19 UPRLs, 3 PSPRLs, and 2 confirmed sites. A summary table for these data is included in Appendix A. During McClaren Environmental Engineering's study of Area B (1986), TCE was detected in one of three soil borings.

BW-18 is the only water supply well currently in service located in Area B and Adjacent On-Base Areas. In 1980, BW-18 was found to be contaminated and was taken out of service in June 1981. With the addition of a wellhead water treatment facility to treat organic compounds, BW-18 has remained an active production well. BW-13 is used intermittently, and BW-17 and BW-19 are currently not in service. Additional data on the operation of these wells is presented in Appendix C. The historic withdrawal of groundwater by on- and off-base water supply wells has affected the groundwater

gradients in Area B and the Southwest Area, but these historical effects cannot be quantified because of the lack of historical water level data.

Horizontal and vertical gradients were estimated from the monthly water-level data. Well cluster MW-120/MW-121/MW-122 is located approximately 2000 feet north of BW-18. Horizontal gradients during the First Quarter 1988 in this area for all three monitoring zones are approximately 0.002 ft/ft. Vertical gradients between the shallow and middle monitoring zones are approximately -0.02 ft/ft (downward flow potential) and between the middle and deep monitoring zones are approximately +0.02 ft/ft (upward flow potential). Closer to BW-18, vertical gradients are steeper as would be expected. Well cluster MW-1021/MW-1022 is located approximately 250 feet to the south of BW-18. The vertical gradient between the shallow and middle monitoring zones during the First Quarter 1988 was approximately -0.11 ft/ft (downward flow potential) at this location.

Although sources of contaminants have not been clearly identified, pumping of BW-18 appears to be inhibiting contaminants from migrating further to the south. Lateral and vertical migration of contaminants is probably dominated by pumping of BW-18. For example, MW-23, a middle zone monitoring well is located approximately 600 feet south of BW-18. TCE has not been detected in this monitoring well that has been sampled since Fourth Quarter 1986. In addition, the two deep zone monitoring wells located approximately 500 feet northwest of BW-18 (MW-63 and MW-132) have consistently contained TCE above drinking water standards.

#### Area C and Adjacent On-Base Areas

There are 48 monitoring wells located in Area C and Adjacent On-Base Areas. Thirty-five of these are network wells, 7 are non-network wells, and 6 are dry wells. Twenty-seven wells are screened in the shallow monitoring zone, 8 are screened in the middle monitoring zone, and 13 are screened in the deep monitoring zone. Most of the monitoring wells located in Area C and Adjacent On-Base Areas are located in and around the southern end of Area C. Eleven of the network wells (MW-133 to MW-143) were installed during the

Fourth Quarter 1987 and sampled by Radian for the first time during the First Quarter 1988. Table 3-8 presents the status of the 48 monitoring wells located in Area C and Adjacent On-Base Areas.

Groundwater contamination was initially detected in 1982, when sampling of two monitoring wells indicated that TCE was present in the shallow groundwater. TCE has been detected in 13 of the shallow zone monitoring wells, 3 of the middle zone monitoring wells, and in 6 of the deep zone monitoring wells. A summary table showing maximum concentrations for TCE and other halocarbons is presented in Table 3-3. Values for individual wells are shown in Appendix B. An interim extraction system, consisting of four extraction wells, is being installed south of Area C (EG&G, 1988). This system, scheduled to begin pumping during the Third Quarter, 1988, will extract groundwater from an area south of Area C for treatment at the Groundwater Treatment Plant.

There are 12 confirmed sites, 28 PSPRLs, and 3 UPRLs that have been identified in Area C and Adjacent On-Base Areas. A summary table of these data is included in Appendix A. The middle and deep zone monitoring wells adjacent to shallow monitoring zone well MW-128 show much lower levels of TCE. Further to the south, however, samples collected from deep zone monitoring wells MW-136 and MW-137 contained elevated levels of TCE (230 and 350 ug/L, respectively). A cluster of wells screened in the middle and deep monitoring zones is located approximately 2,100 feet south of MW-128. During the First Quarter 1988, TCE was detected in MW-135, the middle zone monitoring well. Samples collected from the two deep zone monitoring wells of this cluster did not contain TCE.

Two production wells located in Area C and Adjacent On-Base Areas, BW-6 and BW-16, are reportedly "old farm wells" that existed during the early land acquisition by McClellan AFB, but have not been used by the base. There are no active production wells near Area C.

TABLE 3-8. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN AREA C AND ADJACENT ON-BASE AREAS

Groundwater Monitoring	Network	Non-Network	,a	Total Number
Zone	Wells	Wells	Dry Wells <sup>d</sup>	of Wells
Shallow	MW-215,b	MW-2 <sup>C</sup>	MW-205b	27
	MW-335 <sup>D</sup>	MW-77	MW-225	
	MW-365b	MW-78	MW-34S	
	MW-445 <sup>b</sup>	MW-79	MW-35S	
	MW-60, <sup>b</sup>	MW-80	MW-37	
	MW-61 <sup>b</sup>	MW-81	MW-45sb	
	MW-62	MW-82		
	MW-107			
	MW-110,			
	MW-111 <sup>D</sup>			
	MW-114 <sup>D</sup>			
	MW-128,			
	MW-131 <sup>D</sup>			
	MW-131b MW-139b			
Middle	MW-20D	None	None	8
	MW-21D <sup>b</sup>			
	MW-75			
	MW-108			
	MW-113			
	MW-115			
	MW-129.			
	MW-135 <sup>b</sup>			
Deep	MW-22D <sup>b</sup>	None	None	13
•	MW-109			
	MW-112 MW-130 <sup>b</sup>			
	MW-133			
	MW-134			
	MW-136b			
	MW-137 <sup>b</sup>			
	MW-138			
	MW-140b			
	MW-141 <sup>b</sup>			
	MW-142			
	MW-143			
Total Number		<del></del>	<del> </del>	

These monitoring zone designations do not agree with those defined by EG&G, b (1988).
Samples collected from these wells have contained TCE.

c Well selected for abandonment (destruction).

d Based on recent inspections by Radian, the Air Force is currently evaluating recommendations for well abandonment (destruction).

Potentiometric surface maps for the three groundwater monitoring zones indicate a southerly flow in this portion of the base. The closest production well (BW-18), is located approximately 3,000 feet south of Area C. Vertical gradients are comparable to the horizontal gradients within and south of Area C indicating that heterogeneties in the conductivities and physical properties of the contaminants may be the major influences on downward migration of contaminants. The southerly migration of TCE from Area C is likely influenced by both the groundwater flow patterns and the physical properties of the aquifer material. As more analytical data are collected from the new wells in Area C and additional wells recommended in the Hydrogeologic Assessment Report for McClellan AFB currently underway, migration flow paths may be defined more precisely.

#### The West Area

There are seven monitoring wells located in the West Area. All seven wells are all included in the monitoring well network (Table 3-9). Four are screened in the shallow monitoring zone, two are screened in the middle monitoring zone, and one is screened in the deep monitoring zone. There are two well clusters in the West Area. Three wells (MW-1033, MW-1034, and MW-1035) monitor the shallow, middle, and deep zones, respectively. The second cluster consists of MW-1018 and MW-1032. This cluster monitors the shallow and middle monitoring zones, respectively.

TCE has been detected in samples collected from two shallow zone monitoring wells located in the northern half of the West Area. Tetrachloro-ethene, however, was detected at low levels (0.2 ppb) in one middle zone monitoring well (MW-1034) during the Fourth Quarter 1987. The levels of TCE detected in the two shallow zone monitoring wells are consistently low (<1.0 ug/L) and do not appear to be changing with time. A summary of maximum concentrations for TCE and other halocarbons is presented in Table 3-3. Historical concentrations for wells containing these contaminants are presented in Appendix B.

TABLE 3-9. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN THE WEST AREA

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells	Total Number of Wells
Shallow	MW-1017 MW-1018 <sup>a</sup> MW-1033 MW-1036 <sup>a</sup>	None	None	4
Middle	MW-1032 MW-1034	None	None	2
Deep	MW-1035	None	None	1
Total Number of Wells	7	0	0	7

 $<sup>^{\</sup>mathbf{a}}$  Samples collected from these wells have contained TCE.

The wells located in the West Area are currently referred to as "upgradient" wells. Groundwater flow in this area is to the east-southeast. Contaminants detected in these wells may be a result of off-base migration of contaminants in the past (when groundwater flowed in a westerly direction) or may be emanating from another source. However, there are currently insufficient data to support either of these hypotheses.

#### Area D and Adjacent On-Base Areas, and the Northwest Area

There are a total of 50 monitoring wells located in Area D and Adjacent On-Base Areas and in the Northwest Area. Forty-two are network wells and 8 are non-network wells. This includes 23 wells screened in the shallow monitoring zone, 17 screened in the middle monitoring zone, and 11 screened in the deep monitoring zone (Tables 3-10 and 3-11).

TCE has been detected in 14 shallow zone monitoring wells, 9 middle zone monitoring wells, and 2 deep zone monitoring wells.

As a result of previous evaluation of these data by other USAF contractors, a interim remedial measure (IRM) has been implemented in Area D. This IRM consists of a groundwater extraction and treatment system and a cover consisting of a synthetic liner and clay cap. A detailed evaluation of the effectiveness of the extraction system is presented in Section 5.4.

In Area D and Adjacent On-Base Areas, there are 10 confirmed sites, 2 PSPRLs, and 1 UPRL. These mainly consist of sludge/oil and burn pits. Much of the soil in these areas was removed prior to installation of the cover. A summary table of these data is included in Appendix A.

Prior to operation of the Area D extraction system, groundwater flow and contaminant migration in this area of the base was west-northwest. Since the system became operational, the direction of flow and migration has reversed. Groundwater is flowing towards the base in all three monitoring zones. In addition, concentrations of TCE and other contaminants detected in wells have reduced substantially in both on- and off-base monitoring wells.

TABLE 3-10. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN AREA D AND ADJACENT ON-BASE AREAS

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells	Total Number of Wells
Shallow	MW-10 <sup>a</sup> MW-11 <sup>a</sup> MW-12 <sup>a</sup> MW-12 <sup>a</sup> MW-15 <sup>a</sup> MW-19S <sup>a</sup> , c MW-88 MW-89 MW-90 MW-91 <sup>a</sup> MW-92 <sup>a</sup>	MW-13 <sup>b</sup> MW-56	None	13
Middle	MW - 52 <sup>a</sup> MW - 53 <sup>a</sup> MW - 54 <sup>a</sup> MW - 55 <sup>a</sup> MW - 57 <sup>a</sup> MW - 70 <sup>a</sup> MW - 72 <sup>a</sup>	MW-19D MW-38D <sup>a</sup>	None	9
Deep	MW - 51 MW - 58 <sup>a</sup> MW - 59 <sup>a</sup> MW - 104 MW - 105	MW-1 <sup>b</sup>	None	6
Total Number of Wells	23	5	0	28

a Samples collected from these wells have contained TCE.

b Well has been abandoned (destroyed).

 $<sup>^{\</sup>mathbf{c}}$  Well is periodically dry or contains insufficient water to sample.

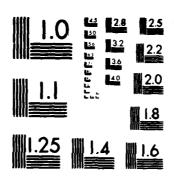
TABLE 3-11. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN THE NORTHWEST AREA

Groundwater Monitering Zone	Network Wells	Non-Network Wells	Dry Wells	Total Number of Wells
Shallow	MW-1002 <sup>a</sup> MW-1004 <sup>a</sup> MW-1005 <sup>a</sup> MW-1009 MW-1019 <sup>a</sup> MW-1026 MW-1029 <sup>a</sup> MW-1029 <sup>a</sup>	MW-1008 <sup>b</sup>	None	9
Middle	MW-74 MW-76 MW-1003 MW-1010 MW-1027 MW-1030 MW-1042 <sup>a</sup>	MW-1007 <sup>b</sup>	None	8
Deep	MW-1001 MW-1028 MW-1031 MW-1043	MW-1006 <sup>b</sup>	None	5
Total Number of Wells	19	3	0	22

<sup>&</sup>lt;sup>a</sup> Samples collected from these wells have contained TCE.

 $<sup>^{\</sup>mathrm{b}}$  Well selected for abandonment (destruction).

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TCE and other halocarbons continue to be detected at low concentrations (<5 ug/L) in two shallow zone monitoring wells located in the southern portion of the Northwest Area (MW-1019 and MW-1029). These wells are also currently located upgradient of McClellan AFB. Contaminants detected may have, as addressed in the West Area discussion, resulted from past off-base migration or may be emanating from another source. However, there is currently insufficient data to support either hypothesis.

#### Other On-Base Areas

There are 25 monitoring wells located in other On-Base Areas. These include 11 network wells, 7 non-network wells, and 8 dry wells. Seventeen wells are screened in the shallow monitoring zone, 7 are screened in the middle monitoring zone, and 2 are screened in the deep monitoring zone (Table 3-12). These wells are located throughout the base as shown on Plate 1, located at the back of this report.

TCE has been detected in two shallow zone monitoring wells and two middle zone monitoring wells at low levels (<1.5 ug/L). These wells are located northeast of Area D, at the southern boundary of the base, and northeast of Area A. A summary of maximum concentrations of TCE and other detected halocarbons is presented in Table 3-3. Individual concentrations of TCE and other contaminants present in these wells are shown in Appendix B.

There are 2 confirmed sites, 3 PSPRLs, and 13 UFRLs located in Other On-Base Areas. These consist of open ditches, landfills, aircraft maintenance hangars, and underground storage tanks. A summary table for these data is included in Appendix A.

#### The Northeast Area

There are two monitoring wells located in the Northeast Area (Table 3-13). One is screened in the shallow monitoring zone (MW-1012) and the other is screened in the deep monitoring zone (MW-1040). Both wells are included in the monitoring well network. Low levels of 1,1,1-TCA have been detected twice

TABLE 3-12. SUMMARY OF MONITORING WELL STATUS AND HISTORICAL OCCURRENCE OF TCE IN OTHER ON-BASE AREAS

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells <sup>c</sup>	Total Number of Wells
Shallow	MW-31S MW-101 MW-102 MW-106 MW-116	MW-16S MW-18S <sup>a</sup> , d MW-43S <sup>a</sup> MW-49S <sup>a</sup> , b	MW-17S MW-24S MW-29S MW-30S MW-42S MW-47S MW-47S MW-48S MW-50	17
Middle	MW-17D <sup>d</sup> MW-18D MW-24D MW-29D MW-100 MW-103	MW-16D <sup>a</sup>	None	7
Deep	None	MW-3 <sup>C</sup> MW-4 <sup>C</sup>	None	2
Total Number of Wells	11	7	8	26

<sup>&</sup>lt;sup>a</sup> Water levels are measured monthly in these wells.

b Groundwater samples are to be collected from these wells during the Third Quarter 1988.

<sup>&</sup>lt;sup>c</sup> Wells selected for abandonment (destruction).

d Samples collected from the wells have contained TCE.

TABLE 3-13. STATUS OF MONITORING WELLS LOCATED IN THE NORTHEAST AREA

Groundwater Monitoring Zone	Network Wells	Non-Network Wells	Dry Wells	Total Number of Wells	
Shallow	MW-1012	None	None		
Middle	None	None	None	0	
Deep	MW-1040	None	None	1	
Total Number of Wells	2	0	0	2	

in MW-1012, but no other halocarbons have been detected in this well. Purgeable halocarbons have not been detected in MW-1040, since the well was initially sampled in 1985. Groundwater flow in this area appears to be to the south-southwest. Because of this on-base flow direction, the two monitoring wells in the Northeast Area are helpful in determining up-gradient water quality and identifying any on-base migration of contaminants.

### 3.8 <u>Summary of Contaminant Migration and Distribution</u>

Based on analyses of the available analytical and hydrologic data, no distinct trends in contaminant migration can be recognized at this time. The limited data available at this time suggest that temporal trends in the lateral migration of contaminants are slow. Available aquifer parameter data, analytical data, and the distribution of monitoring wells are limited for determining migration pathways from PRLs to groundwater monitoring wells. Planned future investigations of PRLs, installation of additional monitoring wells, and subsequent collection of additional groundwater quality data will aid in defining contaminant distribution and migration.

Contaminant distribution appears to be most strongly influenced by the physical characteristics of the aquifer material, the physical properties of the contaminants and groundwater extraction by the base production and extraction wells, and off-base water supply wells.

There is evidence of lateral migration of the contaminants as seen from current maps of TCE concentrations. Comparisons of TCE concentration maps from Second Quarter 1986 with First Quarter 1988, however, show minimal changes in concentrations and areal extent of contaminants. Thus contaminants appear to be migrating laterally at a very slow rate.



#### 4.0 SAMPLING AND ANALYTICAL VARIABILITY

Variability associated with sampling and analytical procedures is inherent in any environmental measurement system. This variability must be quantified before historical trends or patterns can be identified with any degree of confidence because it distinguishes between normal (expected), and "real" changes in the measured parameters; in this case, an increase or decrease in contaminant levels in the groundwater. The variability in the groundwater contaminant results for the McClellan AFB Quarterly Groundwater Sampling and Analysis Program was quantified so that concentration changes could be classified as either being within the expected variability, or representing a change attributable to other factors such as seasonal effects, migration, or degradation. Once a range for sampling and analytical variability is established, deviations beyond this range should be investigated for some other factor which is causing the variability. Thus, this analysis is of primary importance to the trend analysis of Section 5, and in addition, provides an evaluation of the sampling and analysis processes.

In order for the results for the sampling and analysis program to be considered valid, the variation due to sampling and analysis error must be within the guidelines previously established for the Quarterly Sampling and Analysis Program, and formally set forth in the Quality Assurance Project Plan (QAPP) currently being developed. The method for quantifying these errors involves an analysis of the results of laboratory and field duplicates. For this analysis, the results for all field and laboratory duplicate pairs from the Fourth Quarter 1985 through the First Quarter 1988 were considered. The most commonly detected contaminants were evaluated, and include trichloroethene (TCE), tetrachloroethene (PCE), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), 1,1-dichloroethane (1,1-DCA), 1,1,1-trichloroethane (1,1-TCA), vinyl chloride, and chloroform.

Laboratory and field duplicates are collected and analyzed routinely to assess variability attributable to the analytical and sampling processes. Samples for laboratory duplicate analysis are randomly selected after field

samples are received by the laboratory. The results from duplicate analyses provide measures of analytical variability, which includes variability resulting from sample preparation and instrumentation. For example, errors could result from matrix effects, errors in calibration of the instrument, or in computation of the dilution factor.

Field duplicates are collected in the field at the same time as other field samples, and are analyzed under the same conditions using the same laboratory techniques. The field duplicate results measure sampling variability including variations in the heterogeneity of the environment, and variations in sample collection and handling, as well as analytical variability described above. By this definition, field duplicates provide a measure of total variability due to random sources. Thus, also by definition, analytical variability is a component of sampling variability; therefore, sampling (or total) variability is greater than analytical variability.

Field and laboratory duplicate results for samples collected from the Fourth Quarter 1985 through the First Quarter 1988 were compiled for the selected contaminants. The data were screened to include only pairs for which both values are above the Method Detection Limit (MDL). Results below the MDL are reported as "Not Detected" and, therefore, do not represent quantitative values for use in this statistical analysis. Therefore, if either result for the pair was below the MDL, the pair was not included in the calculations.

After screening the results, descriptive statistics (N, mean, standard deviation, range) were calculated to characterize the data. These statistics identified data sets that contain few observations, or show a limited concentration range that might influence the results. Contaminants that had fewer than five pairs of data that satisfied the screening were not evaluated further because making inferences about all measurements from such a small data set would not be useful. For each contaminant which had a sufficient number of pairs of data, four statistics were calculated for both the sample set of field duplicates and the sample set of laboratory duplicates. These statistics are the Coefficient of Variation (CV), the Relative

Percent Difference (RPD), the pooled CV and pooled RPD. An explanation of these terms is given below and the formulas are shown in Table 4-1. Based on the calculations of these statistics, the variability was quantified for the cases where such a quantification could be justified.

The Coefficient of Variation (CV) is the relative standard deviation of a pair of data points; that is, CV is the standard deviation of the pair (S) divided by the mean  $(\bar{x})$  and expressed as a percent. Since the CV is a percentage, it is independent of the magnitude of the concentrations in the data set. Furthermore, it is a standardized value which enables the direct comparison of the variation among pairs for a contaminant. Therefore, for each compound with five or more pairs of valid data points, the CV was calculated for each pair of the laboratory duplicate set and for each pair of the field duplicate set. The pooled CV, CV, is a weighted average of the sum of squared CVs for a series of related CVs, and gives an overall estimate of the variability of the system being evaluated. For each contaminant, the pooled CV was calculated for the sampling or total variability and for the analytical variability. The weights  $(\mathrm{df}_i)$  in this case are all one since each pair represents only one observation.

The Relative Percent Difference (RPD) is the difference of the pair divided by the mean of the pair, expressed as a percent. This statistic is used for paired data and is directly related to the CV since the RPD = /2 x CV. The pooled RPD was calculated similarly to the pooled CV, as an average of the squared RPD values for each set of paired observations. Because both the CV and RPD are used to evaluate control limits, both were calculated. The results for each variability analysis presented in the following subsections are discussed in terms of the RPD rather than the CV since it is specifically applicable to paired data.

TABLE 4-1. RESULTS OF SAMPLING (OR TOTAL) AND ANALYTICAL VARIABILITY ANALYSES

Compound	Total Variability			Analytical Variability		
	n	cv	RPD <sub>P</sub>	n	CV	RPD p
Vinyl chloride	7	15.1	21.3			_
1,1-DCE	26	16.7	23.6	10	19.8	28.0
1,1-DCA	25	14.1	20.0	9	16.4	23.2
Chloroform	19	18.3	26.0			
1,2-DCA	13	11.3	16.0	6	33.5	47.4
1,1,1-TCA	12	21.4	30.3	6	9.5	13.4
TCE	53	21.9	30.9	19	17.8	25.2
PCE	8	12.4	17.6			

CV - 
$$(S/\bar{X}) \times 100$$
,  $S - (X_1 - \bar{X})^2 + (X_2 - \bar{X})^2$ ,  $\bar{X} - \underline{X_1 + X_2}$ 

$$CV_{p} = \begin{bmatrix} n & (CV_{i})^{2} df_{i} / \sum_{i=1}^{n} df_{i} \end{bmatrix}^{1/2}$$

RPD - 
$$\left[ x_1 - x_2 / (x_1 + x_2) / 2 \right] \times 100 - cv (2)^{1/2}$$

$$RPD_{p} - \begin{bmatrix} n \\ \sum_{i=1}^{n} RPD_{i} \end{bmatrix}^{2} n \end{bmatrix}^{1/2}$$

### 4.1 <u>Sampling Variability</u>

A total of 75 field duplicate pairs (or a frequency of 10 percent, as recommended by the U.S. EPA Method and specified by the scope of work), were collected and analyzed from the Fourth Quarter 1985 through the First Quarter 1988. The number of pairs that showed quantitative concentrations for both values of the pair varied significantly, from 0 to 53 pairs for the selected contaminants. Ideally, the quantitative results would be distributed equally over time, that is, approximately the same number of quantitative pairs of field and laboratory duplicates for each quarter. This is not always the case because the laboratory duplicates were selected at random in the laboratory. The field duplicate samples, which were selected during planning for each quarterly sampling effort, generally had a larger number of usable pairs than the laboratory duplicates. However, since there are relatively few pairs of quantitative results over 10 quarters of sampling (relative to the total number of samples collected), it is unrealistic to expect a good temporal distribution.

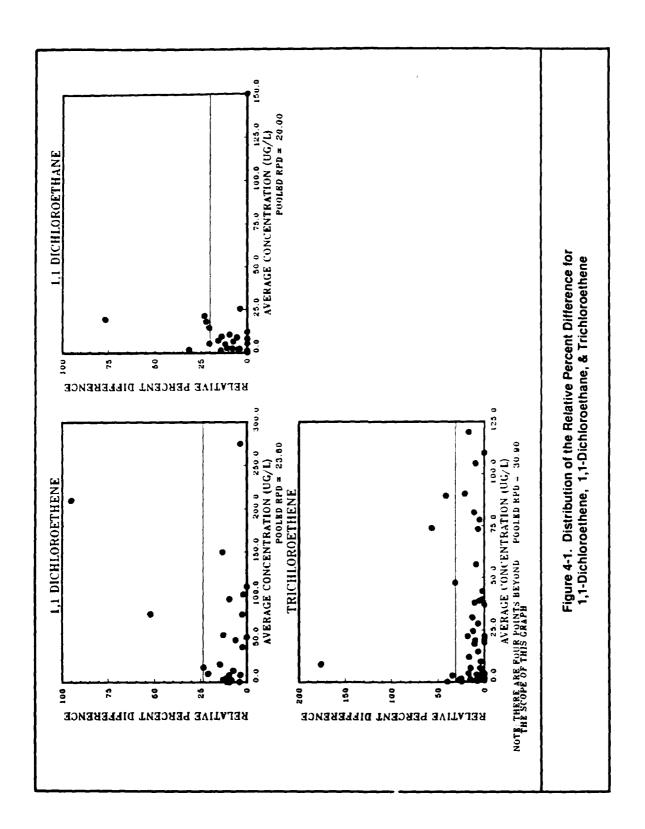
Table 4-1 shows the results for sampling (or total) variability and analytical variability. For sampling variability, the number of quantitative pairs of results used for the calculations ranges from 7 to 53. The pooled results for RPD range from 16.0 percent for 1,2-DCA to 30.9 percent for TCE. These results are well within the objective of 50 percent that has been used throughout this program, and is proposed in the QAPP currently being developed for McClellan AFB. The most common chlorinated solvents (TCE, 1,1-DCE and 1,1-DCA) have the greatest number of pairs of quantitative results and the most equally distributed results over time and, therefore, show the most representative estimates of variability. These contaminants have more than 20 quantitative pairs of results, which approaches what can be defined as a "large" data set, and indicates that the results can be considered to be statistically valid. A general rule is that 30 is considered a large sample set, and a normal distribution of mean results can then be assumed. These are the only compounds for which the sampling variability can be reliably quantified at this time, because they have enough pairs of data to be

percent for 1,1-DCE, and 20 percent for 1,1-DCA. Figure 4-1 shows the distribution of PDSs with respect to the mean concentrations, and pooled RPD for each pair of results for these three compounds. The points are randomly scattered about the pooled RPDs, and do not show a trend with respect to concentration. This indicates that the results are applicable over the entire concentration range reported for the contaminants.

An example of how the calculated variability can be used to interpret a reported value of 5.0 ug/L for TCE. The RPD for TCE is 31 percent, so the expected variability for this result would be 5.0 ug/L  $\pm$  31 percent, or 5.0  $\pm$  1.6 ug/L. For a reported value of 1,000 ug/L, the corresponding range would be 1,000  $\pm$  310 ug/L. Thus, a well with a reported TCE level of 5.0 ug/L would have to show a concentration less than 3.4 ug/L or greater than 6.6 ug/L the next quarter before it could be stated that the TCE concentration groundwater in the well actually exhibited a change that cannot be attributed to total variability. Similarly, for a reported TCE level of 1,000 ug/L, a concentration less than 690 ug/L or greater than 1,310 ug/L the next quarter would be required to show an actual change in concentration.

### 4.2 Analytical Variability

A total of 75 pairs of laboratory duplicates have been analyzed from the fourth quarter of 1985 through the first quarter of 1988, at the same frequency as for field duplicates. However, the number of pairs which show at least one quantitative value is much lower because the samples for duplicate analysis are randomly selected by the laboratory. The low numbers of pairs suitable for characterizing analytical variability limits the sample size which means that there is little statistical confidence in the validity of the results.



Zero to 19 pairs of laboratory duplicate results for the selected contaminants were quantitative. The pooled RPDs range from 13 percent for TCE to 47 percent for 1,2-DCA, as shown in Table 4-1. For 1,2-DCA, however, there were only 6 samples with quantitative results. One pair has an RPD of 112 percent and all other pairs have an RPD of less than 28 percent. Therefore, the large pooled RPD of 47 percent for this analyte is due to the small sample size and one observation causing the pooled result to be high. A larger sample size should minimize the effect of this one value. All other pooled RPD's are less than the objective of 30 percent as proposed in the QAPP. sample sizes are much smaller than those for the sampling variability, and therefore, it is difficult to relate these RPDp's to the RPDp's for total variability. The calculated analytical variability for the most commonly detected contaminants (TCE, 1,1-DCE, and 1,1-DCA) are 25 percent, 28 percent, and 23 percent, respectively. As stated earlier, the analytical variability is a component of the total variability and therefore, the analytical variability should be less than the total variability. TCE is the only analyte with a sample size (19) large enough to be considered valid. pooled RPD for analytical variability is 25 percent compared with 31 percent for total variability.

Again, it should be pointed out that for the set of wells studied for the sampling (or total) variability, there is an analytical variability inherent in the results. Therefore, though it cannot be quantified, the analytical variability for TCE must be less than 31 percent, for 1,1-DCE it must be less than 24 percent and for 1,1-DCA it must be less than 20 percent for the pairs of data points used for the sampling variability. The results of 25, 28, and 23 percent, respectively, calculated for the laboratory duplicate pairs, are based on significantly fewer pairs of data (9 to 19 pairs) than for the corresponding sampling variability results. The different numbers of pairs available for this analysis is probably the reason that the analytical variability results are larger in some cases than the sampling variability. When more pairs are available for this study, the analytical variability should be lower since the pooled RPD will not be influenced so greatly by one observation.

#### 4.3 <u>Conclusions</u>

The results of the variability analyses for sampling (total) variability and analytical variability expressed as RPD can be applied with confidence only for sampling variability for three compounds. The results for TCE, 1,1-DCE, and 1,1-DCA are justifiable, considering the sampling and analytical processes and sources of variability inherent in those processes. These results are also well within the overall data quality objective of a RPD less than 50 percent for field duplicates, which is indicative of good sampling procedures. The factor which limits the degree of confidence for the other contaminants and the analytical variability assessment is that there are too few quantitative data pairs. As more data become available, the results should show analytical variability as a component of total variability. Also, with a larger sample size, a representative sample can be assured.

The calculated variabilities can be applied to assess "real" concentration changes in groundwater contaminants after 30 quantitative data pairs for the other contaminants have been attained to use for the calculations. This number is generally used to define a "large" data set, and the Central Limit Theorem (CLT) can then be applied. Applying the CLT means that the mean of the paired data can be assumed to be normally distributed and representative of the entire population, and statistical inferences are valid. It is expected that as more data are added to the analysis, the results will show a much smaller range that can be applied to all of the well sample data with confidence. The variability results reported here can be applied, but the user must be aware of the limitation imposed by the small sample sizes.

To ensure that adequate information is available to complete this statistical analysis in the future, it is recommended that both laboratory and field duplicate samples be selectively collected from wells that have historically shown quantitative levels of contaminants, and that the wells be selected to cover a range of concentrations. In addition, it would be useful to perform laboratory duplicate analyses on the same wells as the field dupli-

cates in order to better assess how analytical processes contribute to the total variability. For these "nested duplicates," the analytical variability can be quantified as a component of the total variability.

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#### 5.0 TREND ANALYSIS BY AREA

Once the sampling and analytical variability in the concentration of contaminants from quarter to quarter has been addressed, the variability beyond this level must be addressed. The deviations due to sampling and analytical error are purely random effects. The purpose of this section is to discuss the study which was conducted to identify a deterministic component or trend in the variability. Deterministic components could include a periodic effect due to seasonal variation, a gradual change in concentrations that might be attributable to a plume of contaminants in the groundwater, or a marked decrease in concentrations due to the operation of the Area D extraction system. Thus, a trend can be natural or induced. A discussion follows of the seasonal variability, an investigation of normality for the sample data points, and the effects of the Area D extraction system.

Methods of data interpretation that were used to analyze the quarterly groundwater sample data and the results of those analyses are presented in this section. Each analysis was selected to answer a specific question related to determining the magnitude and extent of contamination. In cases where a quantitative method can be applied, such as with the analytical variability of Section 4, then that is the method of choice. Quantitative methods were employed to identify seasonal effects on groundwater contaminant concentrations, and a study to determine if the distribution of the contaminant concentrations follows a normal distribution so that standard parametric statistical methods for trend analysis or pattern recognition are applicable. However, due to the limitations in the data that will be discussed in detail, this approach is often not possible; in these cases, a qualitative approach was chosen.

Semi-quantitative or qualitative methods were used to evaluate the effectiveness of the Area D extraction system. The results of these analyses are presented, and then discussed in relation to the hydrogeologic analysis presented in Section 3.0.

### 5.1 <u>Seasonal Variability</u>

Concentrations of groundwater contaminants measured in monitoring well samples may vary due to seasonal effects and effects from other factors, such as extraction or production well pumping, contaminant migration, and chemical degradation. These effects must be accounted for so that patterns or trends in contaminant concentrations might be identified, allowing better definition of the magnitude and extent of contamination (i.e., how much is present and where does it occur). Therefore, an attempt was made to determine if concentrations of analytes fluctuate solely due to seasonal effects. If it could be determined that the concentrations do decrease or increase by a certain percentage during one season of the year, then this error together with the error for sampling and analytical variability would be considered a tolerance for the contaminant concentrations. Once the tolerance (T) has been quantified, a result which is outside the interval  $(\tilde{X}-T, \tilde{X}+T)$  where  $\tilde{X}$  is the mean concentration, would need to be examined for an additional source of variability.

Methods for evaluating seasonal effects generally focus on identifying a consistent or periodic pattern, such as a decrease or increase in contaminant concentrations during dry seasons. Periodic patterns can be discerned by evaluating plots of concentrations over time after any increasing or decreasing linear trend that may be attributable to other factors (i.e., contaminant migration, chemical degradation) are removed; patterns identified in the plots can then be statistically verified. Another method used to evaluate cyclic patterns compares the mean for one quarter against the mean These two methods are the simplest for for the other three quarters. assessing seasonal effects; more advanced methods have been developed, but they require many years of data (up to 10) before seasonal trends can be reliably quantified. An example of a more advanced method is the time series analysis which is based on the auto correlation coefficient. correlation coefficient is a measure of the linear association between two random variables separated by a number of time periods. For example, the auto correlation coefficient can be used to determine if the result for a parti-

cular quarter is dependent on the result of the previous quarter or the previous two quarters for a particular monitoring well. The autocorrelation coefficient is the correlation coefficient between concentrations for two different quarters for the same monitoring well. It differs from the usual correlation coefficient in that it measures dependence over time rather than distance. According to Miller and Wichern, "these auto correlation estimates can be unstable for short series and hence are ordinarily calculated only for series consisting of (approximately) 50 or more observations" (Miller and Wichern, 1977).

The limitation of the small sample size in the McClellan AFB quarterly results is compounded by the fact that the two years of available data are for years when annual rates of precipitation were well above or below normal. There was extremely high precipitation in 1986, and extremely low precipitation in 1987, and continuing into 1988. Specific precipitation data is cited in the Hydrogeologic Assessment Report prepared for Area C (E.G.&G., 1987).

Prior to applying any statistical methods several problems were identified that merit consideration. The first problem in determining seasonal variability is the limitation in the amount of data. There is a maximum of eight points which represent two years of monitoring for any well. This is the minimum number of points that should be used to begin assessment for seasonal effects using any of the commonly applied methods. The small sample size precludes the establishment of a difference in the mean of one quarter versus the other three quarters because at best there would be only two data points for each season for years of extreme high and low precipitation. Second, many of the wells in the vicinity of Area D extraction system have been influenced by pumping to such a degree that any other factors have become negligible. Third, wells located in Area C that have high levels of contamination lie near the blending and aeration ponds associated with the Industrial Wastewater Treatment Plant. Leaks in these ponds could provide a continual source of artificial recharge not influenced by seasonal precipitation. Additionally, it is reasonable to assume that time dependence,

or serial correlation, from quarter to quarter affects the contaminant concentrations; that is, there is a carry-over of information from quarter to quarter and possibly a lag of two or more quarters before samples can be assumed to be independent. In other words, water samples collected from the same well for two or more consecutive quarters may actually be considered to be from the same unit of water, and do not represent separate independent samples. This time dependence can be quantified by the auto correlation coefficient discussed above, but again it will require a more extended period of sampling to accomplish.

Several steps were taken to analyze the data, their limitations, and the effect they might have on the results. Only shallow monitoring zone wells were included in this study since they would be the most likely to experience seasonal fluctuations and would respond to leaching of contaminants from the unsaturated zone. The first step taken to analyze the data for these wells was to plot contaminant levels and water levels versus time for each well (See Appendix D). These plots were qualitatively evaluated to identify any patterns that could be attributable to seasonal effects. The next step was to apply some of the previously recommended statistical techniques for quantifying seasonality. Linear trends were identified using linear Linear temporal trends were removed from the data and the residual data were plotted to look for cyclical patterns. For wells that did not show any linear trends, the data were compared to the mean value by calculating the distance from the mean and plotting the results to check for cyclical patterns. This analysis was conducted to screen the available data and identify wells or areas that may be suitable for future seasonal variability analysis. Other quantitative methods may be applicable when more data are available.

### 5.1.1 Methodology

To increase sample size, an effort was made to group wells in close proximity to each other and consider the total number of data points as the sample size. The advantage of having a larger sample size is that even if the

distribution of the population is not normal, the mean of the sample will be approximately normal if the sample size is "large" (N>30) under the Central Limit Theorem. The larger sample size would allow parametric statistical methods such as the t-test to be applied to the mean without determining the underlying distribution of the population. Based on this reasoning, the following groups of shallow monitoring zone wells were designated (Plate 1):

- Group 1 = MW-27S, MW-67, MW-68;
- Group 2 = MW-23S, MW-41S, MW-1021;
- Group 3 MW-21S, MW-33S, MW-61, MW-128, MW-131;
- Group 4 = MW-20S, MW-36S, MW-44S;
- Group 5 MW-1002, MW-1004, MW-1005; and
- Group 6 MW-106, MW-1019, MW-1029.

The same statistical methods were applied to these groups as were applied to each individual well. However, the validity of considering neighboring wells together was questionable because such a sample would not be independent and random if the results from wells near each other embody redundant information. Therefore, the conclusion was that the grouping of wells is not a valid approach and the remainder of the discussion will focus on the individual wells from each group.

As described above, graphs for the individual wells showing the water level and the contaminant concentrations over time were produced. The most common contaminant detected in samples collected from the wells is trichloroethene (TCE); therefore, most of the analysis was done with TCE data. In wells where other analytes are present, additional graphs showing those compounds were produced.

The next step was to detect any linear trend in contaminant concentrations over time. A simple linear regression with the sample date as the independent variable and TCE concentrations as the dependent variable was used to establish the linear trend. If a definite linear trend was established, it was subtracted and the residuals, or differences, were analyzed for cyclical

patterns by plotting and inspecting a graph of the residuals in relation to the mean concentration over time.

From examination of the water-level and contaminant graphs, it was hypothesized that water levels might influence the concentration of the contaminant. A few of the graphs showed an apparent negative correlation; that is, the concentration of the TCE decreased as the water level increased. To determine if a significant correlation exists for these wells, a simple linear regression was performed with the water level as the independent variable and TCE concentration as the dependent variable. If an adequate linear model could be found for the TCE as a function of the water level, then a conclusion might be that TCE concentration fluctuates seasonally in relation to recharge or the amount of rainfall.

From evaluation of the graphs, it also appeared possible that both time and water level could affect the concentrations of TCE to some degree. To assess this possibility a multiple regression model was constructed with both the sample date and the water level as independent variables and the level of TCE as the dependent variable. The multiple regression model has the potential of establishing whether time, water level, or both of these factors contribute significantly to the variability in the level of TCE, or if other factors account for most of the deviation.

### 5.1.2 <u>Discussion of Statistical Methods</u>

The method of simple linear regression requires construction of a linear model for a dependent variable as a function of an independent variable. In this case, the first model employed the sample date as the independent variable and the TCE concentration as the dependent variable. The second linear model employed the water level as the independent variable with TCE concentration as the dependent variable. The reason a linear model is constructed is to detect a general increasing or decreasing trend over time. If the regression model can be validated and the slope of the linear model can

be proved statistically to be different from zero then there is a trend for concentrations for the well and that trend must be negated or removed.

Four underlying assumptions must be satisfied to validate the models: a) the underlying relationship is linear, b) independence of errors, c) constant variance, and d) normal distribution of errors. The error or residual is the difference between the predicted value of the model and the actual result from the sampling program. When plotted, these errors should show no pattern and should be randomly scattered to show independence. Also as the concentration increases, the errors should stay within the same range. If there is a consistent pattern of increasing error, then the assumption of a constant variance has been violated. The model and the residuals were examined to determine if these assumptions were violated.

If these assumptions are valid, the predicted relationship between the variables should be evaluated for how well it fits the data points. The technique for evaluating the fit involves the calculation of the F statistic and the R-Square statistic. F is the ratio of the mean square due to the model (MSR) to the mean square for pure error (MSE) or MSR/MSE. If the model is invalid, meaning that there is no linear relationship, then F will be near one. On the other hand, if there is a linear relationship, the amount of variation that can be accounted for by the model (MSR) should be greater than the residual variation (MSE). Therefore, a large F value is an indication of a valid linear model. The F statistic has a F-distribution with 1 and (n-2) degrees of freedom so that a test of the null hypothesis (i.e., there is no linear relationship) can be conducted by comparing the value of the F ratio with the appropriate percentage point of the F (1, n-2) distribution. If F exceeds this point, the linear model can be assumed to be valid. Also, the R-Square statistic (a ratio of the sum of squares due to linear regression to the total sum of squares of the data points) is an indication of the adequacy of a linear model. If the model fits the data adequately, R-Square should be near one, indicating that R-Square multiplied by 100 percent of the variability in the concentration is explained by the linear regression.

The multiple linear regression is simply an extension of the simple linear regression; in this case, concentrations of TCE would be modeled as a function of both sample date and water level. The same assumptions apply as in the simple linear regression case. The R-Square statistic for two variables should again be examined to determine the percentage of variability explained by the model, just as with the simple regression model.

The final method of analysis for seasonal effects was a study of the individual wells for cyclical behavior. The method for this analysis involved determining the mean, XBAR, for the concentration of TCE in each well. Then the differences,  $Y_i$ , between the individual concentrations,  $X_i$  and the mean (i.e.,  $Y_i = X_i$  - XBAR) were plotted in reference to the line Y = 0. Graphs for each well were studied to determine if any patterns could be established, such as a number of consecutive quarters below 0 and then greater than 0 for a length of time, possibly continuing in a periodic manner.

#### 5.1.3 Results

No obvious patterns for the levels of contaminants were indicated in the graphs of water level versus concentration. In most cases, the concentrations fluctuate markedly from quarter to quarter. However, in almost all cases there was a high concentration peak during the Third Quarter 1987, and levels have been decreasing since that time. Reexamination of the QA/QC data for the Third Quarter of 1987 indicates that there were no abnormal results which could discount the validity of these data points. In addition, during 1985 and 1986, samples were not collected during the third quarter of the year. Only in 1987 has Radian collected samples during the third quarter. It is possible that an increase in concentrations of contaminants may occur during this time of year. If this is the case, Radian will evaluate this occurrence in the next informal technical report.

The details of the results of all statistical methods applied will be discussed by the groups (area) described in Section 5.1.1 for the purposes of organization and discussion.

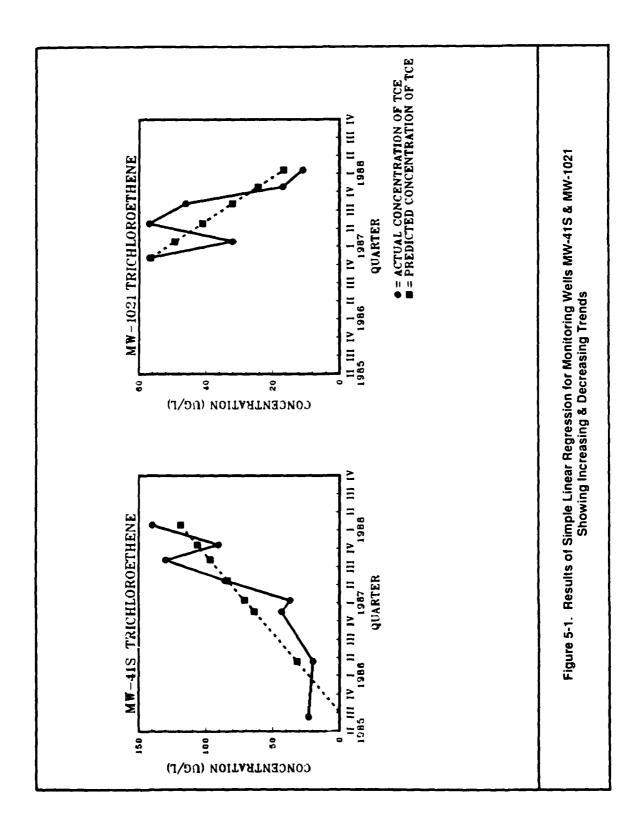
Group 1 contains three shallow zone monitoring wells from Area A (MW-27S, MW-67, and MW-68). MW-27S was sampled only once during 6/85 before becoming dry and contained TCE at a concentration of 63 ug/L. Contaminants were not detected in MW-67 and MW-68. Thus, no statistical methods were carried out for these wells because there were no data points to evaluate.

Group 2 contains three shallow zone monitoring wells from Area B (MW-23S, MW-41S, and MW-1021). MW-23S was sampled only once during 6/85 and showed a level of 2.70 ug/L for TCE. MW-41S showed a significant positive linear trend over time, as depicted in Figure 5-1, indicating a steady increase in the level of TCE. The F value is 16.25 and is, therefore, highly significant. There is 99 percent confidence that the model should be accepted. The calculated R-Square was 0.73, indicating that 73 percent of the variability in the data can be accounted for by the sample date. The multiple linear regression showed that the water level was not an important factor to include in the model. Therefore, the predicted value from the simple linear regression was subtracted from the actual value of the TCE in analyzing this well. The third well in this group, MW-1021, showed a moderate correlation between the level of TCE and sample date in Figure 5-1. The R-Square for MW-1021 is .57 and the F value is 5.49. Thus, the linear model is valid at the 90-percent confidence level. However, the trend for this well is decreasing.

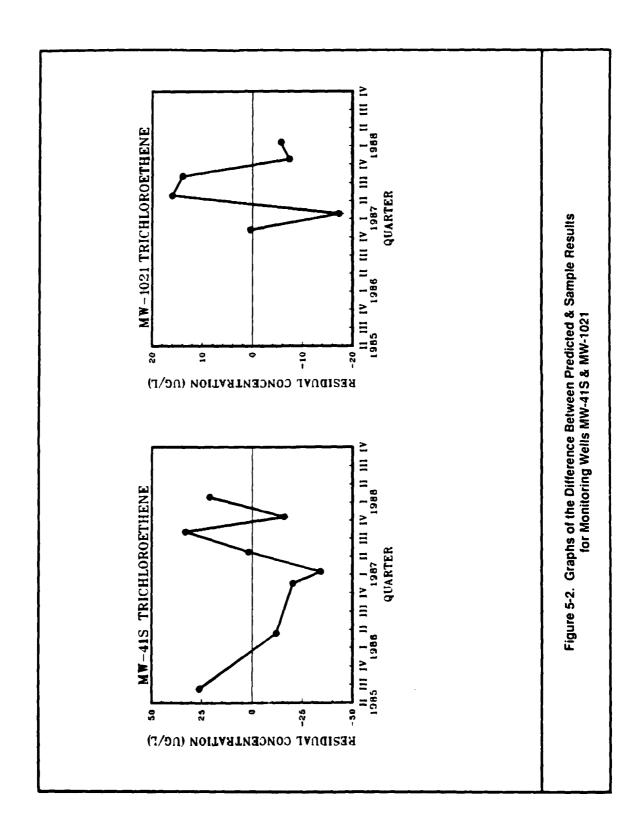
In the study of these wells individually, the plots of the residuals were examined for patterns (Figure 5-2). MW-1021 has only six data points while MW-41S has eight. No pattern can be clearly established with so few points, but these wells are recommended for future analysis for periodic behavior.

Group 3 consists of five wells in the southern part of Area C, MW-21S, MW-33S, MW-61, MW-128, and MW-131. Individual analysis showed that none of these wells exhibit significant linear trends in relation to either time or water level, therefore, the data points were not adjusted before plotting the differences from the mean. Four of the wells, MW-21S, MW-33S,





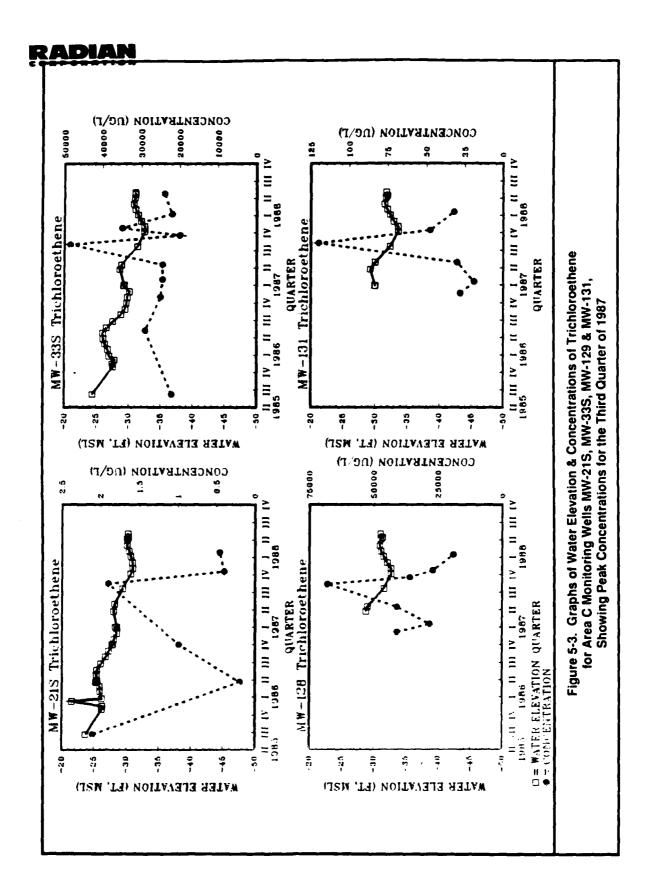


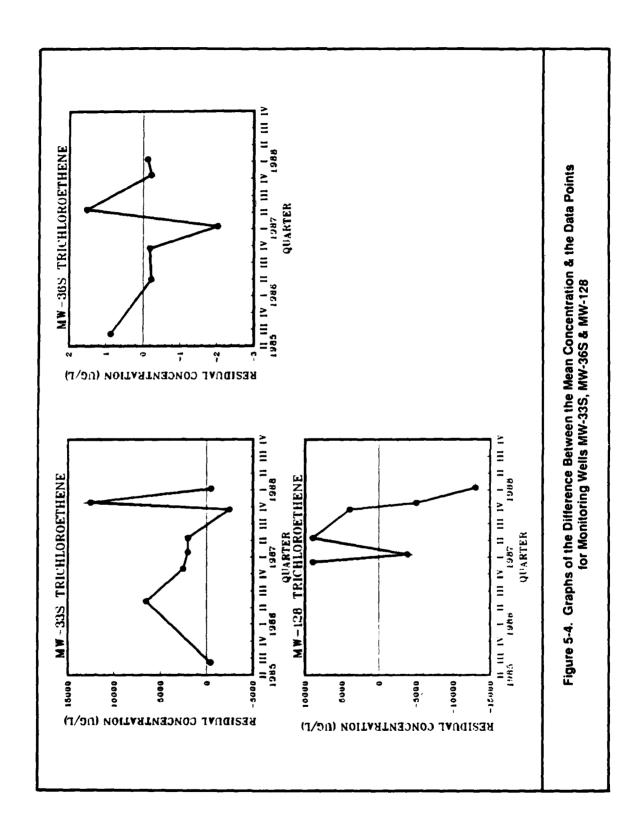


MW-128, and MW-131, had an unusually high concentration peak during the Third Quarter 1987 as shown in Figure 5-3. Thus, if that peak was due to analytical or sampling artifacts, the mean could be artificially high and any cyclical pattern might be overlooked. To test this possibility, the Third Quarter 1987 data point was removed, the mean and differences were recomputed, and the data were plotted again. No patterns were evident, although some seasonal trend might be established when more data are available. MW-33S and MW-128 have high levels of TCE and should be analyzed for trends again when data from subsequent quarterly sampling efforts become available. From the plot of water level and concentration of TCE, it appears that the water level and TCE concentrations follow similar curves for some quarters. However, the regression analysis with water level as the independent variable shows no significant correlation. The R-square value is only .07 meaning that only 7% of the variation in the concentration of TCE can be accounted for by the variation in water level. The residual plots for these two wells are included in Figure 5-4.

Of the three Area C wells in Group 4, MW-20S was sampled only twice while MW-36S and MW-44S have been sampled seven times each. TCE appeared in MW-44S at low levels during the most recent two quarters but was not detected before then. No other compounds were detected in MW-44S. MW-36S also has only low levels of TCE. No linear trends were significant, but there was a peak in the Third Quarter 1987 similar to the wells previously discussed. Trichlorofluoromethane (TCFM) was also consistently present in this well and the graphs show a curve similar to that of TCE at much higher concentrations, with the point for the Third Quarter 1987 much higher than the others. The fact that the two compounds behave in a similar manner may be an indication that seasonal variation is a factor for this well. Therefore, MW-36S should be analyzed for seasonal variation in the future. The residual plot for this well is included in Figure 5-4.

Group 5 consists of three wells in the Northwest Area, MW-1002, MW-1004, and MW-1005. MW-1002 has contained only low levels of TCE up to 1.7 ug/L. MW-1004 has contained TCE ranging from 14 to 27 ug/L, while MW-1005 has





contained TCE in the range of 14.5 to 100 ug/L. None of these wells shows a significant linear trend. Examination of  $X_i$  - XBAR for all of these wells seems random, indicating no apparent trends or patterns. However, graphs for TCE, 1,1-DCA, and 1,1-DCE for MW-1004; and TCE, 1,1-DCA, 1,1-DCE, 1,2-DCA, and 1,1,1-TCA for MW-1005 all exhibit a downward trend for the last three quarters. It is possible that since these wells are located in close proximity to Area D, they are affected by the extraction system. The possible effect of the Area D extraction system on these wells is discussed in Section 5.4.

Group 6 includes MW-106, located in Other On-Base Areas and MW-1019 and MW-1029 located in the Northwest Area. Contaminants have not been detected in samples collected from MW-106. The levels of TCE in MW-1019 and MW-1029 range from 0.5 to 4.3 ug/L; 1,1-DCA is also present in both wells at low concentrations. There were no significant linear trends to subtract in either well. With such low concentrations and the interval for total variability being plus or minus 31 percent, much of the variability can be accounted for by the sampling and analytical processes. However, it should be noted that these two wells seem to exhibit similar patterns of fluctuation, and seasonal variability may prove to be a factor in the future.

### 5.1.4 <u>Conclusions</u>

The major conclusion of this analysis is that if there is any seasonal variability, the effect is largely masked by other sources of variability throughout the base. No conclusion with respect to a definite seasonal effect can be reached with the available data. In some areas of the base, wells have been identified that might indicate seasonal variation after data from subsequent quarterly sampling efforts have been collected. Among these wells are MW-41S, MW-1021, MW-33S, MW-128, MW-36S, MW-1019, and MW-1029.

No clear seasonal pattern has been established for any wells or well groupings. The linear regression showed that there is little, if any, correlation between the water level and the concentration of TCE. Only MW-41S and MW-1021 showed significant linear trends over time. It is interesting to note that these two wells are close to each other and have similar curves for water level, but exhibit opposite linear trends of concentrations of TCE.

The result of this study is that other factors outweigh the effect of seasonality on contaminant concentrations, and in fact, suggest that the seasonal factors are negligible for the majority of wells. Furthermore, for the wells that are possibly affected by seasonal changes, data from additional quarters of sampling are needed to determine conclusively that a cycle exists, and to quantify the magnitude of fluctuation so that the amount of variability due to seasonal factors can be quantified.

### 5.2 <u>Investigation of Normality</u>

A study was done to determine if the monitoring well analytical results are normally distributed and whether it would be appropriate to assess the results using traditional statistical methods such as the t-test and ANOVA (Analysis of Variance). In the future, should analytical results from one quarter appear to be higher or lower than the other three quarters for a given year, then the t-test could be applied to statistically validate that hypothesis only if the sample data set is normally distributed or if the sample data set is "large." Conversely, if no one quarter emerges as being obviously different from the other quarters, an ANOVA analysis should be performed, but again is only valid under the assumption of normality. For non-normal data, the Mann-Whitney distribution-free test should be used in place of the t-test; whereas, the Kruska-Wallis test is the distribution-free counterpart to ANOVA. According to Harris, et al., the non-parametric tests are only 86.4 percent as efficient as the parametric tests.

### 5.2.1 Normality Testing Methods

The null hypothesis for this test is that the analytical results represent a sample from a normal distribution. There are several methods that can be used to accept or reject this hypothesis. Since the number of samples from individual wells is small (less than 9), the analytical results were also analyzed by grouping of wells on the basis of geographic proximity, and groundwater monitoring zones. The well groups for this statistical analysis were the same as previously defined in the seasonality study except that for the normality study, wells from all monitoring zones were included and each monitoring zone was considered separately. In this statistical analysis, the method of grouping the wells was considered to be a valid approach and thus the investigation of normality was necessary to determine if parametric methods could be applied.

According to Harris et al. (1987), the best indicator of non-normality for groundwater variables is the skewness coefficient. The analysis conducted for the McClellan AFB monitoring wells also considered the measure of kurtosis, the Shapiro-Wilk Test (W), and examination of the boxplot and normal probability plot. Each of these statistics was computed using the SAS® procedure Univariate of the Statistical Application System, SAS®, Release 6.02. The contaminants 1,1-dichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane, trichloroethene, and tetrachloroethene were considered because these are the most prevalent compounds found on-base.

Preliminary examination of the data points indicates that a large percentage of the results are below the data reporting threshold, with high concentrations reported for some wells. Since the distribution of concentrations is skewed toward zero, a transformation of the data may be an appropriate step to achieve normality. The technique of logarithmic transformation of data is supported by the fact that many geologic variables are lognormally distributed. In some cases if the original data set is not normal, a transformation can result in a normal distribution. The logarithm transformation was considered most likely to achieve normality for the monitoring well

results. Therefore, the natural log transformation for each trichloroethene data point was also tested for normality by well. To perform the transformation, each result reported as not detected was read as half the method detection limit to avoid having natural log of 0 values, then the natural logarithm of each data value was computed, and the resulting data set was analyzed for normality for each individual well.

The study of the groups of wells suggested another means of relating the results obtained for one well to the results obtained for another well. A standardizing technique was attempted in which the analytical results for each well were standardized to obtain a mean of zero and a standard deviation of one. Standardizing is a technique for removing location and scale attributes from a set of data. For this analysis, location and scale attributes are the range and variation of concentrations. It was our hypothesis that standardization might equalize values from wells with high concentrations to wells with only low concentrations. Similarly, in an effort to obtain normality within groups of wells, the data points for TCE for each well of the group were standardized to a mean of zero and standard deviation of one. The resulting data set was again analyzed for normality by group and groundwater zone.

### 5.2.2 Application of Statistical Methods

Given the distribution of the data for a well or group of wells, that is, having many values below the data reporting threshold, a departure from normality is likely to show up as a skewed distribution rather than other departures from normality. This means that the distribution is not symmetrical. For this reason, it is important to examine the skewness coefficient. The skewness coefficient is an indication of the symmetry of the distribution with respect to the mean. For a normal symmetrical distribution, the skewness coefficient is zero. A negative skewness coefficient would be expected for a sample distribution with many low values and few high ones, such as those reported for the monitoring wells. The Shapiro-Wilk or W statistic must also be checked for each data set representing a well or group of wells. The W statistic is the ratio of the best estimator of the variance to the usual

corrected sum of squares estimator of the variance. W always lies between zero and one with small values leading to rejection of the null hypothesis that the sample values are a random sample from a normal distribution. In other words, the larger the value of W, the higher the probability that the underlying population is normal. The probability of obtaining a higher value for W for this test is also given by the SAS® Univariate procedure.

The measure of Kurtosis is an indication of the height of the distribution. If the distribution is normal, the coefficient of Kurtosis would be equal to 3. A coefficient larger than 3 indicates the distribution is too steep to be a normal distribution, whereas a coefficient less than 3 would indicate that the curve is too flat.

The two plots that are helpful in determining departures from normality are the boxplot and the normal probability plot. The box plot or schematic plot can be useful in picturing the shape of the distribution, especially for skewed samples and for identifying outliers. A box is drawn such that the bottom and top edges are located at the 25th and 75th percentiles. A horizontal line is drawn at the sample median, and a plus sign is drawn at the sample mean. Vertical lines extend from either end of the box as far as the data extend or to at most 1.5 interquartile (range between 25th and 75th percentiles) ranges, whichever is less. More extreme values are marked with zero if they are within three interquartile ranges, or with an asterisk if still more extreme. Theoretically, the plot should appear symmetrical, with the mean and median in the middle of the box, and vertical lines extending from both ends. The normal probability plot shows the expected normal values for a distribution with the same mean and standard deviation plotted versus the sample values so that obvious departures from normality are evident.

### 5.2.3 Results and Conclusions

None of the groups of wells presented a good fit for normal data. The predominant deviation was in the skewness coefficient, because most groups

contain a large number of not detected, or zero values. The lognormal transformation was also unsuccessful. None of the groups or individual wells could be demonstrated to have a normal or lognormal distribution at the 95% confidence level for any of the contaminants. The standardizing technique also produced negative results. None of the standardized values for the groups follows a normal distribution for trichloroethene.

None of the contaminants (trichloroethene, 1,1-dichloroethane, 1,2-dichloroethane, 1,1,1-trichloroethane, and tetrachloroethene) were found to have a normal or lognormal distribution for the samples for individual wells either. More data is needed to be able to determine the distribution of these variables, or whether another transformation would be able to achieve normality.

For future reports, this analysis should be repeated since it is difficult to show that very small sample sets are normal. If the same conclusion that the data do not appear to be normal or log-normal is reached, then the distribution-free techniques should be used.

### 5.3 Effectiveness of the Area D Extraction System

The purpose of this section is to evaluate the effectiveness of the Area D extraction system by evaluating trends in hydrologic and analytical data with respect to time. The extraction system was initially tested in December 1986 and became fully operational in March 1987. The system consists of six extraction wells pumping at a cumulative rate of approximately 100 gallons per minute. The six wells are screened between 40 and 160 feet below the ground surface (the recognized depth of contamination in Area D). In addition to the six extraction wells, a synthetic liner and clay cap have been installed over the area of identified soil contamination in Area D. The cap was installed to prevent further leaching of contaminants from the unsaturated zone and reduce the impact to groundwater quality.

### 5.3.1 Data Analysis Approach

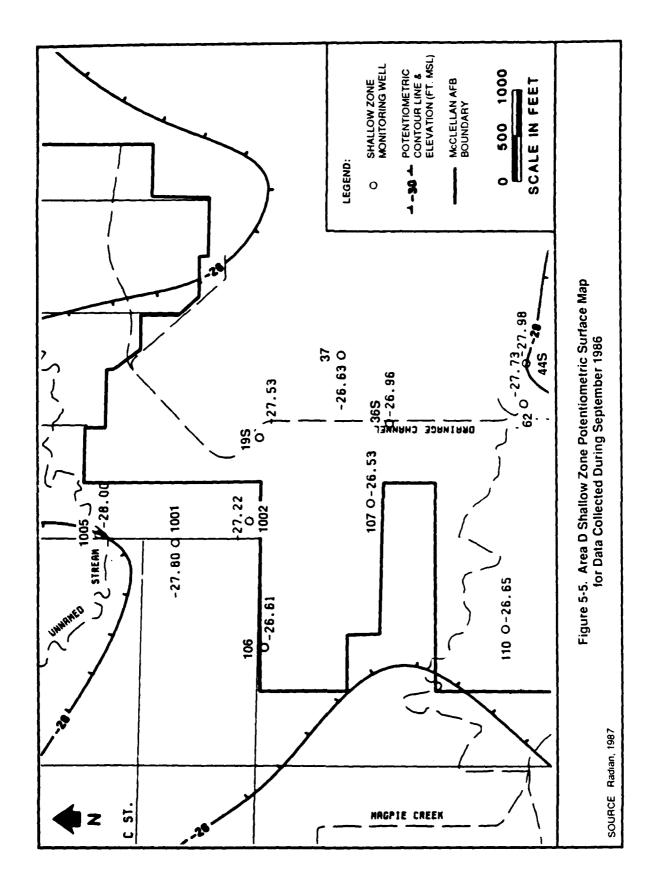
There are two sources of data that were used to identify trends and evaluate the effectiveness of the Area D extraction system: 1) water-level data, and 2) historical analytical data obtained from wells in the vicinity of Area D. Water-level data were evaluated for flow directions and gradient reversal, and the analytical data were used to assess any trend in contaminant concentration measurable in monitoring wells that could be attributed to the extraction system.

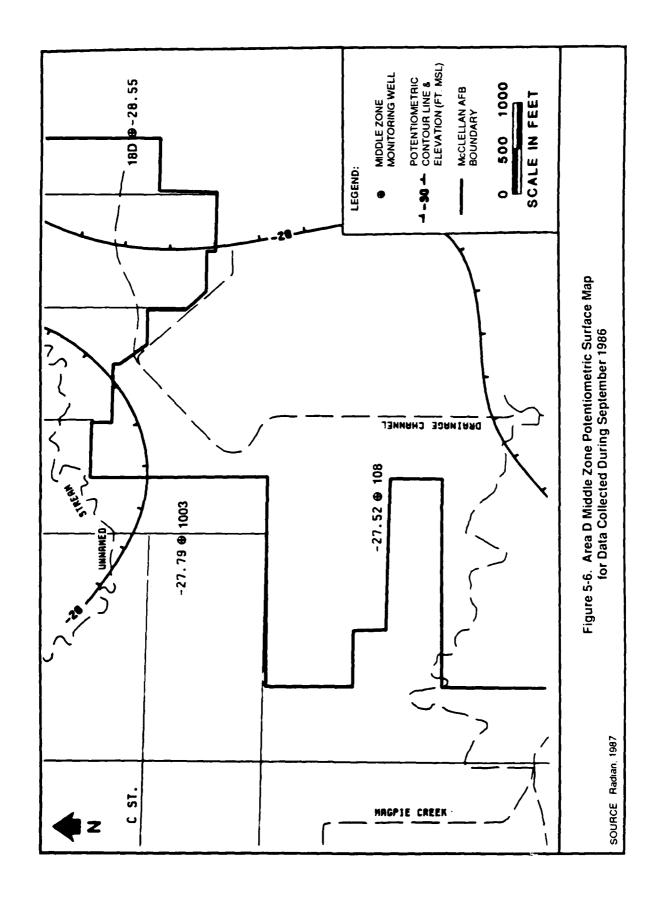
There are several monitoring wells located in the vicinity of the Area D extraction system that were used as indicators of the general aquifer behavior. Although the alluvial deposits in the area are very heterogeneous, it was assumed for the purpose of this analysis that the data from monitoring wells within Area D and the Northwest Area are indicative of behavior in the aquifer zones influenced by the extraction wells. There is a limitation to this assumption; monitoring well screened intervals are not distributed uniformly through the aquifer zones. Also, the middle zone monitoring wells are clustered to the northwest and the deep zone wells are clustered to the west.

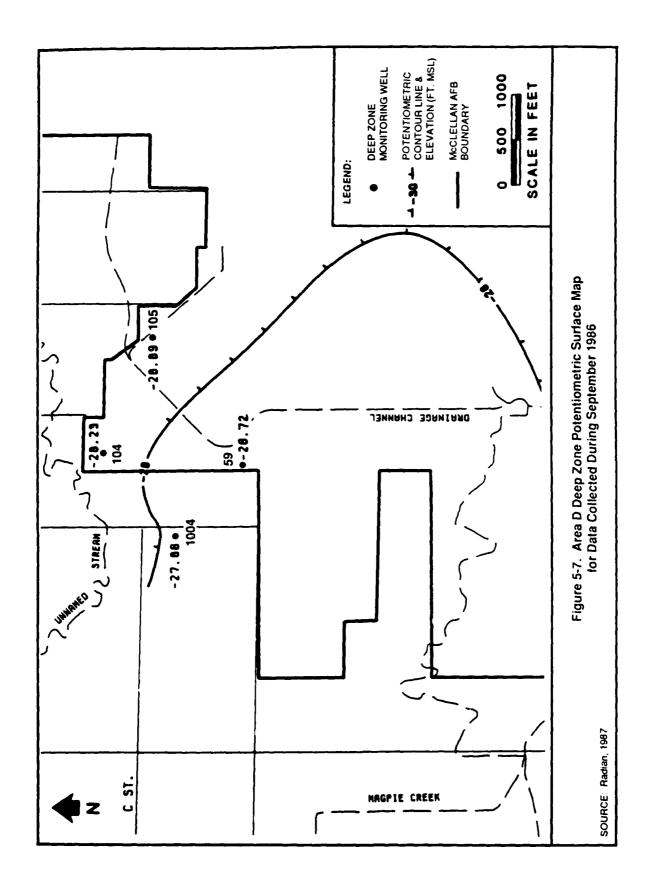
### 5.3.2 Groundwater Flow

A measure of the effectiveness of the extraction system is the ability of the system to affect the groundwater flow directions and gradients in Area D. The data used in evaluating the groundwater flow were obtained from water-level measurements taken quarterly from the Fourth Quarter 1986 through the Fourth Quarter 1987 and monthly thereafter.

Observed groundwater gradients from 1986 to the present give the best indication of the changes affected by withdrawal of groundwater by the extraction system. Figures 5-5 through 5-7 and Plates 2 through 6 (located at the back of this report) illustrate the changes in groundwater gradients in each of the three monitoring zones beneath Area D. The represented water-







level data were collected in September 1986, prior to extraction of ground-water, and March 1988.

Plates 2 through 6 show that continuous pumping by the six Area D extraction wells has induced a cone of depression in each three of the monitoring zones beneath Area D. As shown on these figures, the cone of depression is more areally extensive in the shallow monitoring zone and decreases in extent with depth. As a result of the decrease in hydraulic head produced by groundwater withdrawal, the direction of groundwater flow in the Northwest Area adjacent to Area D was altered from a northwesterly flow, away from Area D prior to pumping, to a southeasterly flow toward the extraction system after pumping began. While the pumps extract contaminated groundwater from Area D, they cause a gradient reversal which creates a barrier to further migration of contaminants off base, thereby mitigating the impact of contamination to water quality in this area.

### 5.3.3 <u>Concentrations of Contaminants</u>

Results of monitoring and extraction well samples analyzed by U.S. EPA Method 601 were used for trend analysis in Area D and the Northwest Area. Among the analytes detected by this method, halogenated hydrocarbons (vinyl chloride, 1,1-DCE, 1,1-DCA, total-1,2-DCE, 1,2-DCA, 1,1,1-TCA, TCE, and PCE) are the most prevalent groundwater contaminants detected in wells at McClellan AFB. The following discussions qualitatively assess the analytical results for samples collected from the extraction wells and quantitatively assess results of analyses from nearby monitoring wells.

Analytical data in Table 5-1 show that samples collected from the Area D extraction wells since October 1987 have contained levels of some halogenated halocarbons exceeding DOHS and U.S. EPA drinking water standards. Results of other analyses are also shown but will not be used in this discussion. Concentrations of compounds detected are similar in magnitude to those detected in samples collected from adjacent shallow zone monitoring wells. Because the extraction wells are pumping groundwater with contaminants and

TABLE 5-1. ANALYTES DETECTED IN BOTACTION WELLS LOCATED IN REFA D AND ADJACENT ON BASE AREAS, MACKELAN APB

	900	U.S.EN				L NMBER						
	Action	Primary MC.	24-73	<b>E4-73</b>	E4-73	E4-73	<b>15</b> +73	B4-73	£4-83	<b>194-8</b> 3	28 <del>-1</del> 43	E8-83
Date Sampled Monitoring Zone Field Amalysis			10/24/87	11/03/87	12/02/87	on/06/88	02/01/88	03/01/88	10/24/87	11/03/87	12/02/87	01/06/88
Lab Aralysis												
U.S. EPA Merhod 601 (ug/1)												
Viryl chloride	7	-		2400C	2700C	£	14000	15000	ž	2	2	¥
Methylene chloride	3	냋	≨	2	2	≨	10000	2	ž	2	£	ž
1,1-Dichloroethers	•	,	¥	14000C	300000	£	12000C	9100C	ş	999	370C	ž
1,1-Dichloroethere	8	吳	<b>≨</b>	14000	1200C	£	1,4000	1000C	2	2	2	ž
Total 1,2-Dichlomethere	16	벌	¥	70007	3900C	£	2200C	15000	≨	2	2	ş
Orloroform	100	81	ž	2	2	£	2	2	ž	140	2	Į
1,2-Dichloroethere	-	'n	ş	9)C	1060	ž	1300	730	≨	2	2	ş
1,1,1-Trichloroethere	200	200	≨	2900C	1600C	ž	2000C	1300C	Ş	<b>3</b> 8	360	£
Trichlorcethere	\$	<b>د</b>	¥	13000	1100C	£	1400C	1100C	ž	<b>76C</b>	7##C	ş
1,1,2-Trichloroethere	100	띨	≨	2	1400	¥	2	£	ş	2	2	ź
Tetrachloroethere	4	吳	<b>≨</b>	1200	810	₹	£	370	≨	16C	2	¥
1,2-Dichloroberzene	051	鬲	≨	2	2	£	2	<del>2</del>	ş	2	2	£
U.S. EPA Method 602 (ug/1)												
Chloroberzene	æ	¥	≨	2	2	≨	£	2	≨	2	2	ş
1,2-Otchlorobergene	130	吳	2	2	2	ž	2	2	≨	2	2	ş
Ethylbersene	9	吳	ž	2	2	£	2	2	ş	2	2	ş
Tolume	100	强	<b>£</b>	2087	2600	≨	<b>88</b> 0C	2800	≨	2	2	ş
U.S. EPA Method 624 (ug/1)												
Viryl chloride	7		1100	£	≨	1400	ž	≨	2	£	ž	2
1,1-Dichloroethere	•	1	15000	≨.	ş	10000	£	ž	550	≨	£	<b>8</b> 9
1,1-Dichloroethare	8	뇓	1700	ş	≨	1700	≨	¥	2	Ź	≨	2
Total 1,2-Dichloroethere	16	岁	2700	ş	≨	2700	¥	≨	2	Į	≨	2
1,2-Dichloroethare	-	~	2	ş	≨	2	ş	¥	2	≨	¥	2
1,1,1-Trichlorcethare	200	200	1400	ş	≨	1500	¥	æ	7,1	≨	ž	83
Trichloroethane	s	~	1400	ş	≨	0071	≨	¥	73	≨	≨	r
Berzere	۲.	\$	2	ş	≨	2	≨	£	2	≨	≨	2
Tolugre	100	<u> </u>	790 190	ž	ž	95	ž	Į	2	£	ž	2
Apetone	Ä	¥	13000B	ž		22000	¥	ş	2	ž	ş	2
2-Batanone	실	뜅	7,000	ž	£	15000	¥	ž	2	ž	¥	2
4-Mechani -2 -count arrene	12	į	2	¥.	£	6100 B	≨	Z	2	£	≨	2

BM = Extraction Well
 NO = Nothing detected
 NA = Not analyzed
 B = Comporent detected in laboratory blank - not edited
 C = Analysis confirmed in second column analysis
 NE = Not established

TABLE 5-1. (CONTINUED)

	DOME	U.S. EPA			TIEM	1. NUMBER						
	Action	Primary M.C.	E4-73	B4-73	E4-73	E4-73	84-73	B4-73	<b>E4-</b> 83	<b>134</b> −83	58- <b>4</b> €	124-83 124-83
Date Sampled Munitoring Zone Field Analysis Lab Analysis			10/24/87	11/03/87	12/02/87	01/06/88	02/01/88	03/01/88	10/24/87	11/03/87	12/02/87	01/06/38
U.S. EPA Method 625 (ug/1)												
1.3-Dichloropersene	130	Ä	5.1(6.27)	ş	£	≨	ź	£	2	≨	ž	Ź
1.2-Dichlorobergene	130	7	አ አ	£	≨	ž.	≨	≨	2	£	<b>≨</b>	ž
1, 4-Dichlorobarzene	¥	05/	8.8(14.52)	£	£	£	ź	≨	2	ź	ž	ž
Di-n-buryl phrhalate	Ή	2	2	ž	ž	ž	Į.	£	2	£	ž	ž
Isoniprore	2	¥	13	£	¥	£	≨	≨	2	£	ž	ž
Narhthalene	¥	<u> </u>	19	£	ž	ź	¥	£	2	£	ž	ş
Herrel	¥	<u> </u>	7.6	£	£	£	≨	ş	2	£	ž	ž
4-Nectry triperol	¥	2	92	£	≨	£	2	≨	2	£	2	ž
Berzolc acid	2	Z	200	ž	<b>£</b>	£	ž	ž	2	ź	ž	ş
U.S. EPA Method 200.7 (mg/1)												
Arsenic	¥	0.050	0.019	ž	≨	£	≨	ş	0.004	≨	≨	ş
Chromium	¥	0.050	2	£	£	≨	≨	≨	0.01	≨	ž	ž
Nickel	<u>1</u>	2	90.0	£	Ę	≨	£	≨	2	£	¥	ş
Silver	×	050.0	2	£	£	£	ž	≨	2	£	≨	ş
Zinc	¥	쒿	0.03	£	2	ž	≨	ž	90.0	£	ž	≨
										the state of the s		

B4 = Extraction Well.
 ND = Northing descreted
 NA = Not analyzed
 ( ) = Limit of quartitation. Indicates result below limit of quartitation.
 NE = Not established

TABLE 5-1. (CONTINUED)

Market and Land State of the Colorines o		Action	Primary M2.	28- <del>1</del> 83	\$ <del>1</del>	<del>2</del> 4 4 5 6	76	<b>3</b>	**	8-10	78-16	<b>36</b>	28 18
Participal Caregory	Date Sampled			02/01/88	03/01/88	10/24/87	11/03/87	12/02/87	01/06/88	98/90/10	02/01/88	03/01/88	10/24/87
1.2 Obtainmentum	Manitoring Zone Field Analysis							i i			ì		
S. BN Heized 601 (ag/1)         2         1         80         MA         90C         850         MA         90C           Veryly of clusterine         0         RE         1100         NO         MA         1000         1000         MA         MA         300C           1.1-Godinocentrem         0         RE         1100         NO         MA         100C         100C         MA         100C           1.1-Godinocentrem         0         RE         100         NO         MA         100C         100C         MA         100C           Chalch locentrem         1         0         10         MA         100C         100C         MA         MA         100C           1.1-Trabal cornertrem         1         5         10         10         MA         MA         100C         NA         MA         MA         100C           1.1-Trabal cornertrem         1         1         1         1         1         MA         MA <td>Lab Aralysis</td> <td></td> <td></td> <td></td> <td>ļ</td> <td></td> <td></td> <td></td> <td>Ą</td> <td><b>9</b></td> <td></td> <td></td> <td></td>	Lab Aralysis				ļ				Ą	<b>9</b>			
With districtal         10	U.S. EPA Method 601 (ug/1)						-						
1.1-Obditionethers	Viry! chloride	~	7	2	2	ş	9300	BSOC	£	<b>£</b>	3300	2059	≨
1.1-Ordinocecheme	Methylene chloride	3	¥	1100	2	ž	2	2	£	2	3500	2	ź
1.1-Obditionethers	1,1-Dichloroethere	v	^	550C	2069	¥	16000	1200C	2	<b>4</b>	13000	16000	. ≨
1.2-Dichlocretime	1,1-Dichloroethane	R	7	2	2	≨	1800	140C	ž	. ≨	170C	240C	<b>£</b>
1,2 thicknesstrant	Total 1,2-Dichloroethere	91	爱	2	2	≨	<b>160</b> C	3900	.€		2530	2800	≨
1.2-Dichlococchare 1.2-Dichlococchare 2.0 2.0 7-6	Orloroform	100	91	2	2	≨	2	2	ž	ž	2	2	≨
1.1.2-fitch decordane	1,2-Dichloroethane	7	۰,	2	2	Ş	1300	<b>3</b> 80	\$	ž	700	108C	≨
1.1-2-Tichalcorethree	1,1,1-Trichlopoethane	902	200	7#C	<b>38</b>	≨	3300	160C	ž	£	240C	180C	≨
Tetrachococchane 100 NE NO	Trichloroethene	'n	\$	209	5.YC	Ę	11000	7200	ž	≨	20%	1100C	£
12-Ordertocetamen	1,1,2-Trichloroethane	901	¥	2	2	≨	2	2	£	ž	2	2	ş
1.2-Dichlochemene 130 NE NO NA 950 NO NA NA 220  S. PRA Nethold (20 (44)1)  S. PRA Nethold (20 (44)1)  S. PRA Nethold (20 (44)1)  1.2-Dichlochemene 130 NE NO NO NA NA NA NO NO NA	Tet rachloroethere	4	¥	8. %	<b>9</b> .90	≨	95	2	ž	ž	2	Ş	Į
12-Dichlocotenzer		130	<u>¥</u>	2	2	≨	<b>3</b> 6	9	£	ş	22	<b>203</b>	≨
1.2-Old-brockersers			!	!									
12-Dichloroberate	Chiorobergere	8	<b>Y</b>	2	2	≨	2	2	£	£	2	8. 88.	≨
Phylibaracte   660   NE   ND   NA   ND   ND	1, 2-Dichloroberzene	130	¥	2	2	£	ğ	2	ž	≨	9	8	ž
Delugate   100   NE   ND   NA   ND   NA   ND   NA   ND   NA   ACC	Rhylbergere	9 3	2	2	2	ş	9	2	ž	¥	2	3.80	ž
1.1-Dichlorocethere	Toltere	001	¥	2	2	≨	2	2	ž	ş	504	<b>5</b> 90	ž
1,11-b)chlotrocheme	U.S. EPA Method 624 (ug/1)												
1.1-Old-lotroethere         6         7         NA         NA         1600         NA         1200         1200         NA           1.1-Old-lotroethere         20         NE         NA         NA         NA         NA         150         160         NA           1.1-Old-lotroethere         16         NE         NA	Viryl chloride	7	-	£	≨	370	£	¥	8	097	ž	¥	2
1.1-Dicklotrocethare   20   NE   NA   NA   220   NA   NA   150   NA   NA   NA   NA   NA   NA   NA   N	1,1-Dichloroethene	φ	,	£	ž	1600	£	£	1200	1200	ž	ž	2200
Total 1,2-Dichloroethere   16   NE   NA   NA   310   NA   NA   250   250   NA   NA   1,2-Dichloroethere   1	1,1-Dichloroethane	R	¥	£	≨	87	£	<b>≨</b>	81	160	ž	ž	2
1.2-Dichloroethare         1         5         NA         NA         110         NA         NA         5         NA           1.1.1-Trichloroethare         200         200         NA	Total 1,2-Dichloroethere	16	7	£	<b>≨</b>	310	ž	\$	250	250	ž	£	2
1,1,1-Trichlocretame	1,2-Dichloroethane	-	2	£	≨	110	£	£	ጽ	*	ź	¥	2
Prich corottone   5   5   Na   Na   1500   Na   Na   1100   1100   Na   Na   1500   Na   Na   1500   Na   Na   1500   Na   Na   Na   1500   Na   Na   Na   Na   Na   Na   Na	1,1,1-Trichloroethane	200	200	£	≨	190	£	≨	180	180	£	¥	057
No.	Trichloroethene	ş	s	Z	<b>£</b>	1500	£	ş	1100	1100	≨	¥	2400
Tolume	Berzane	۲.	2	<b>≨</b>	2	26 B	ź	£	2	2	ž	¥	2
Acetare No.	Toluene	100	¥	£	2	£	£	₹	2	2	£	ş	2
2-Barance NE NE NA	Aretare	¥	¥	≨	ž	2	¥	<b>£</b>	2	2	£	¥	2
### ### ### ### ### ##################	2-Butanone	IJ	7	ž	ž	₽	ž	¥	2	2	£	ş	2
:	4-Methyl-2-pentanne	Ä	2	≨	2	Ê	£	£	2	2	ž	¥	2
	1DA = First laboratory deplicate an	alysis											
	# 60	nalysis											
	Ħ	column analysis											
		ry blank - not	edited										

5-28

TABLE 5-1. (CONTINUED)

	DORS Action Level	U.S.EPA Primary MZ.	28 <del>-1</del> 83	S <del>3 -1</del> 13	5 3 3	HELL NIMBER BH-84	187-64 187-64	78-PE	78-119	78- <del>1</del> 53	76-FG	SB-183
Date Sampled Munitoring Zone Field Analysis Lab Analysis			02/01/88	03/01/88	10/24/87	11/03/87	12/02/87	01/06/88	01/06/88	02/01/88	03/01/88	10/24/87
								***************************************				
U.S. EPA Perinci 6.25 (ug/1) 1.3-Dichloroberzene	130	<u>19</u>	.≨	2	Ş	<b>\$</b>	<b>3</b>	2	3	4	<b>½</b>	9
1,2-Dichloroberserse	130	1	≨	. ≨	<b>1</b> 8	ž	<b>£</b>	. ≨	ź	£	≨	2
1,4-Dichlorobergere	2	<b>3</b> 5	≨	<b>£</b>	2	<b>£</b>	<b>£</b>	£	. ≨	£	ž	2
Di-n-bucyl phthalate	Ä	哥	£	<b>≨</b>	2	£	≨	<b>£</b>	ž	£	ž	17 B
Legitorare	Ä	¥	¥	£	2	ž	<b>£</b>	<b>≨</b>	ź	ź	ž	2
Nephthalene	꾶	발	<b>≨</b>	≨	2	ž	<b>≨</b>	ž	ź	£	ž	2
Prerol	Ä	Ä	<b>£</b>	<b>≨</b>	2	ž	≨	ž	ź	£	ž	2
4-Nerthylphemal	날	¥	£	≨	2	ž	ž	¥	ž	Z	ž	2
Benzoic acid	¥	Ä	≨	<b>£</b>	2	<b>£</b>	ź	<b>£</b>	<b>≨</b>	£	£	2
U.S. EPA Method 200.7 (mg/1)												
Arsenic	Ä	0.050	ž	<b>£</b>	0.00	£	<b>£</b>	<b>£</b>	ź	£	ž	0.00
Ortentum	¥	0.050	ş	ž	2	£	≨	\$	£	ž	ž	0.0
Nickel	Ä	Ä	≨	<b>*</b>	80.0	£	£	<b>£</b>	£	£	£	2
Silver	¥	0.050	≨	≨	2	<b>£</b>	£	ž	£	£	£	2
Zinc Zinc	¥		£	≨	0.11	2	£	<b>£</b>	£	ž	ž	90.0

BW = Extraction Well

LIM = First laboratory deplicate analysis

LIB = Second laboratory deplicate analysis

NE = Not established

ND = Nothing detected

NM = Not analyzed

B = Corporar detected in laboratory blank - not edited

	900	U.S.EPA			3	L NUMBER						
	Action	Primary M.C.	8	29-153 29-153	<b>58</b> + <b>8</b> 2	59-48	<b>9</b>	2 <del>3</del> - <u>13</u>	86 150	98 181	86-180 180	98-18
Date Sampled			13/03/87	11/03/87	12/02/87	01/06/88	02/01/88	03/01/88	10/24/87	11/03/87	12/02/87	01/06/88
Minitoring Zone Field Analysis												
Lab Aralysis			Ą	<b>9</b> 53								
U.S. EPA Method 601 (ug/1)							<u> </u>					
Wayl chlorids	7	-	2	2	2	ž	2	2	<b>£</b>	2	2	£
Methylene chloride	3	₩	2	2	2	£	2100	2	≨	2	2	ž
1,1-Dichlorcethere	•	,	22000	2200C	1800C	£	1200C	16000	<b>£</b>	1300	260	ź
1,1-Dichloroethane	R	발	14C	130	2	£	130	2	ş	2	2	≨
Total 1,2-Dichloroethers	91	<b>¥</b>	) (2)	<b>20</b>	2	£	180	22	ž	2	2	ź
Chloroform	90	8	5.20	2	2	£	2	2	ž	2	2	≨
1,2-Dichlorcethere		٠	170	170	2	į	2	130	ž	2	2	£
1,1,1-Trichloroethere	900	930	<b>610</b> C	930C	70C	≨	3200	2800	¥.	<b>98</b>	259	<b>£</b>
Trichloroethers	~	•	1400C	1400C	1200C	£	3078	1000C	ž	360	360	¥
1,1,2-Trichloroethars	90 00 00	Ä	2	2	2	¥.	2	2	£	2	2	¥
Tet rachl oroethere	4	널	2	2	2	£	2	2	≨	2	2	¥
1, 2-Dichlorobenzene	33	¥	2	2	₽	£	2	2	<b>£</b>	2	2	¥
U.S. EPA Method 602 (ug/1)												
Chlorobergere	æ	¥	2	2	2	¥	2	2	£	2	2	≨
1,2-Dichlorobenzers	130	ك	2	2	2	£	2	2	<b>£</b>	2	9	¥
Ehylberzere	<b>9</b>	쒿	2	2	2	¥	2	2	<b>≨</b>	2	2	≨
Tolume	9	Ή	2	2	2	≨	2	2	ž	2	2	¥
U.S. EPA Method 624 (ug/1)												
Viryl chloride	~	~	≨	ş	<b>≨</b>	2	£	≨	2	£	¥	2
1,1-Dichloroethere	9	7	£	≨	£	1700	ş	≨	\$	£	ž	130
1,1-Dichlotoethane	R	禹	≨	ž	ş	2	£	≨	2	ž	≨	2
Total 1,2-Dichloroethere	93	Ή	£	<b>≨</b>	≨	×	<b>£</b>	ź	2	£	≨	2
1,2-Dichloroethere	-	~	£	≨	≨	2	≨	ź	2	£	≨	2
1,1,1-Trichloroethane	<b>0</b>	002	≨	≨	ž	9	<b>£</b>	≨	32	£	≨	<b>38</b>
Trichloroethene	•	2	<b>£</b>	<b>≨</b>	≨	1700	≨	¥	77	ź	ž	<b>3</b> 8
Berzere	۲.	2	ž	<b>≨</b>	≨	2	≨	≨	2	ž	≨	2
Tolume	90	吳	ž	ş	≨	2	≨	<b>£</b>	2	≨	≨	2
Acetone	Ħ	¥	<b>£</b>	<b>§</b>	ş	2	≨	£	2	£	ž	2
2-Batanone	¥	벌	≨	<b>≨</b>	¥	2	ž	<b>£</b>	2	£	≨	2
4-Methyl-2-pentarane	일	¥	≨	<b>§</b>	ş	2	¥	ž	2	₹	Į	2
U.S. EPA Method 625 (ug/1)												
1, 3-Dichloroberzene	33	<u> </u>	≨	§.	Ş	£	¥	ž	£	ž	<b>£</b>	<b>≨</b>
	-											

BW = Entraction Well
LIM = First laboratory deplicate analysis
LIB = Second laboratory deplicate analysis
NE = Nor established
ND = Nothing detected
NM = Nor analyzed
C = Analysis confirmed in second column analysis

TABLE 5-1. (CONTINUED)

	200	C.S.D			5	T. NEMBER						
	Action	Primary M.C.	S9-48	S9-163	84-85	S8-48	28- <del>1</del> 8	SB-163	98-73	<b>3</b>	**	<b>8</b>
Date Sempled Manitoring Zone			11/03/87	11/03/87	12/02/87	01/06/88	02/01/88	03/10/88	10/24/87	11/03/87	12/02/87	01/06/88
Field fealysis Lab fealysis			<b>4</b>	<b>9</b>								
U.S. EPA Method 625 (ug/1)												
1, 2-Dichlorobersers	130	¥	£	¥	ž	£	ž	ž	2	£	¥	ź
1, 4-Dichloroberzers	¥	35	<b>≨</b>	¥	ž	≨	ž	ž	2	£	¥	ž
Di-n-turyi pirhalate	¥	Ä	<b>£</b>	≨	£	ź	<b>£</b>	≨	2	£	Į	ž
Legioran	닐	¥	≨	¥	≨	ž	<b>\$</b>	≨	2	£	£	ź
Naphthalone	¥	河	Ş	\$	ž	ź	ž	<b>≨</b>	2	£	£	£
Prevol	<b>9</b>	2	ş	¥	≨	ź	ž	£	9	£	Ź	Ź
4-Methylphenol	Ä	쒿	ž	ž	ź	ź	ž	≨	2	¥	≨	£
Bergoic acid	Ä	2	ž	≨	£	£	ž	2	2	¥	≨	ź
U.S. EPA Method 200.7 (mg/l)												
Arsenic	꾶	0.050	<b>£</b>	2	ž	ž	ž	£	900.0	¥	≨	Ź
Chromium	Ä	0.050	£	ž	ž	£	ž	£	10.0	£	ž	Ź
Nickel	Ä	뇓	£	£	ž	≨	ş	ž	2	ž	≨	≨
Silver	甬	0.050	£	\$	<b>\$</b>	₹	<b>\$</b>	ž	2	£	¥	£
2hrc	Ä	Ή	£	¥	<b>≨</b>	£	ž	ž	0.0	£	≨	ź

By = Entraction Well
LIM = First laboratory deplicate analysis
LIE = Second laboratory deplicate analysis
ND = Nothing detected
NA = Not analyzed
NE = Not established

TABLE 5-1. (CONTINUED)

	300	100										
	Action	Primary M.C.	86-48	98 18	78-HI	19+81 19+87	18-18	E4-67	E4-87	19-49	28-103	18 <del>1</del> -87
Date Sampled Manitoring Zone Field Antonio			02/01/88	03/01/88	10/24/87	10/24/87	10/24/87	11/03/87	12/02/87	01/06/85	02/01/88	03/01/88
Lab Analysis						NG1	<b>9</b>					
U.S. EPA Method 601 (ug/1)												
Viryl chloride	7		2	2	£	£	£	9	2	ž	9	9
Methylene chloride	3	¥	110	2	ž	£	. ₹	2	9	. ≨	7.60	9
1,1-0ichloroethere	•	^	5051	1500	£	£	≨	8	710	≨	28	200
1,1-Dichloroethane	8	更	9	2	ź	£	ź	2	2	£	2	2
Total 1,2-Dichloroethere	16	曼	2	2	≨	≨	ź	8	2	ž	0.930	1.10
Chloroform	100	901	2	2	≨	£	≨	2	2	≨	2	2
1,2-Dichloroethane		\$	2	2	ş	Į	≨	2	2	ž	2	2
1,1,1-Trichloroethere	88	902	282	900	ş	£	≨	2.60	2	≨	2.4C	3.00
Trichloroethere	'n	•	<b>53C</b>	910	<b>≨</b>	£	≨	9.30	8.30	ž	160	x
1,1,2-Trichloroethere	<b>10</b>	빌	2	2	ž	£	ş	2	2	ž	2	2
Tetrachloroethene	4	2	2	2	ş	£	€	2	2	<b>£</b>	2	2
1,2-Dichloroberzene	130	2	2	2	ž	£	ž	2	2	≨	2	2
U.S. EPA Method 602 (ug/1)												
Onloroberzene	Я	일	2	2	ş	ž	ź	2	2	ž	2	2
1,2-Dichlorobergers	130	Ή	2	2	<b>≨</b>	£	ź	2	2	£	2	2
Phylbergere	<b>9</b> 9	벌	2	2	ş	≨	≨	2	2	ž	2	2
Toluene	100	뇓	2	2	ş	£	ź	2	2	ž	2	2
U.S. EPA Method 624 (ug/1)												
Viryl chloride	7	-	ž	<b>£</b>	2	£	£	ž	ž	2	Ş	<b>£</b>
1,1-Dichlorcethere	9	1	ž	ž	97	ž	Ę	₹		3	ž	£
1,1-Dichloroethane	8	벌	≨	£	2	<b>£</b>	<b>£</b>	ž	ž	2	¥	≨
Total 1,2-Dichlorov:here	16	벌	≨	<b>≨</b>	2	£	£	£	<b>£</b>	2	¥	£
1,2-Dichloroethane	1	٠	≨	<b>£</b>	2	£	≨	≨	≨	2	ž	≨
1,1,1-Trichlocoethere	<b>00</b> 2	8	ź	ž	2	£	£	£	≨	2	ž	≨
Trichlorcethene	ş	•	ž	£	8.5	≨	≨	ž	≨	16	¥	¥
Berzene	ζ.	٠	≨	\$	2	£	£	ž	ž	2	ź	£
Tolume	100	띨	£	ş	2	£	ž	≨.	≨	2	ž	<b>£</b>
Acetore	발	¥	≨	≨	2	£	≨	¥	<b>£</b>	2	¥	¥
2-Butanone	띺	벌	ž	£	2	≨	≨	ž	≨	2	ş	¥
	Ä	Æ	¥	≨.	2	¥	£	<b>£</b>	ž	2	£	¥
U.S. EPA Method 625 (ug/1)	;	ţ	i	i								
1, 3-Dichloroberzene	130	¥	≨	≨	2	£	<b>£</b>	£	£	ž	≨	<b>£</b>
												,

BM = Extraction Well
LIM = First laboratory deplicate analysis
LIB = Second laboratory deplicate analysis
NE = Nor established
ND = Norhing detected
NM = Nor analyzed
C = Analysis confirmed in second column analysis



TAME S-1. (CONTINUED)

	\$ <del>8</del>	U.S.EPA			15	L NAMER						
	Action	Primary MX.	96 <del>-1</del> 67	9 <del>8 1</del> 8	DH-87	B4-87	18-487	EN-87	B4-87	B-87	18-43	18 <del>4-8</del> 7
Date Sampled Manitoring Cree Field Andread			02/01/88	03/01/88	10/24/87	10/24/87	10/24/87	11/03/87	12/02/87	01/06/88	02/01/88	03/10/68
Lab Analysis						Š	99					
U.S. EPA Method 625 (ug/1)									-			
1,2-Dichlorobenzene	130	¥	¥	≨	2	£	<b>£</b>	Ş	£	ž	¥	£
1,4-Dichlorobergere	¥	35	¥	≨	2	£	£	£	ž	ž	£	ž
Di-n-turyl pirchalate	¥	벌	≨	ź	2	ž	ž	<b>≨</b>	<b>≨</b>	£	ž	ž
<b>Leaphorone</b>	¥	널	<b>≨</b>	ş	2	£	ž	£	£	ž	£	ž
Naphthalone	¥	Ä	≨	≨	2	¥	ž	Ş	ş	ž	¥	ž
Phenol	Ä	발	≨	≨	2	ź	<b>≨</b>	ž	ş	ž	ź	ž
4-Methylphanol	띺	Ä	≨	<b>£</b>	2	ž	£	¥	ź	£	<b>£</b>	ž
Berzoic acid	¥	2	<b>≨</b>	£	2	ž	≨	≨	≨	£	ž	¥
U.S. EPA Method 200.7 (mg/l)												
Arsenic	Æ	0.050	≨	ş	ź	0.005	0.004	ş	¥	£	¥	¥
Ourombine	ك	0.050	≨	≨	≨	0.02	0.02	≨	≨	£	≨	¥
Nickel	У	¥	<b>≨</b>	≨	ź	2	2	ž	≨	¥	£	≨
Silver	¥	0.050	≨	≨	<b>≨</b>	2	0.00	ş	£	£	≨	2
Zinc	Ä	¥	\$	≨	Į	0.07	0.07	ş	≨	ź	ź	¥

EM = Extraction Well

LDA = First laboratory deplicate analysis

LDB = Second laboratory deplicate analysis

ND = Nething detected

NA = Not analyzed

NE = Not established

concentrations equivalent to these detected in shallow monitoring wells, it may be concluded that the extraction system is removing contaminants from the shallow monitoring zone.

Figures 5-8 through 5-16 show the concentrations of various compounds measured in nearby monitoring wells over the period from the Fourth Quarter 1986 to the First Quarter 1988. Data in the figures indicate that most of the monitoring wells showed a distinct decreasing trend in concentrations over this time period. Some monitoring wells show less distinct trends than others, but the overall trend is clearly toward decreasing concentrations.

Several of the shallow zone monitoring wells located in the southern portion of Area D and in the Northwest Area do not show a consistent decrease (Figures 5-8 through 5-11). MW-91 shows a definite decrease in the concentration of 1,1-dichloroethane, whereas the data for trichloroethene are somewhat erratic.

The middle zone monitoring wells in Area D (MW-54 and MW-55) show definite decreasing concentrations for all analytes (Figures 5-12 through 5-14). In this zone, all the detected analytes exhibit similar patterns in contaminant concentrations.

The deep zone monitoring wells in Area D (MW-58 and MW-59) also show decreasing concentration trends (Figures 5-15 and 5-16). The concentrations from MW-58 for 1,1,1-trichloroethene and trichloroethene exhibit increasing trends until the Third Quarter 1987 after which a sharp decreasing trend is observed. As mentioned previously in Section 4.0, this increase may be an artifact of the sampling or analytical processes during the Third Quarter 1987.

Table 5-2 lists the percentage change and the absolute change in concentration for several contaminants over the time period studied for monitoring wells located in Area D and the Northwest Area. In many cases, the



TABLE 5-2. ABSOLUTE AND PERCENTAGE CHANCES IN CONTAMINANT CONCENTRATIONS FOR MONITORING WELLS LOCATED IN AREA D AND ADJACENT ON-BASE AREAS AND THE NORTHWEST AREA (INITIAL DATE OF SAMPLING THROUGH THE FIRST QUARTER 1988)

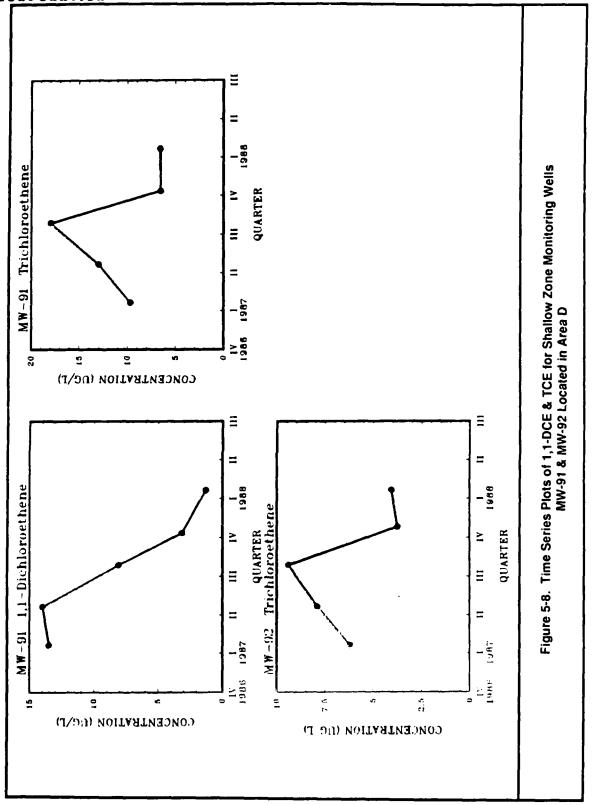
Monitoring Well Number	Initial Sampling Date	Compound	Absolute Change (ug/L)	DOHS Action Level (ug/L)	Percentage Change (%)
AREA D AND A	DJACENT ON-B	ASF AREAS:			
Shallow Moni	toring Zone:				
MW-91	01/20/87	1,1-Dichloroethene Trichloroethene	14.0 to 1.3 9.9 to 6.6	6 5	-90 -33
MJ-92	01/20/87	Trichloroethene	6.2 to 4.4	5	-29
Middle Monit	oring Zone:				
MJ-54	11/20/86	Vinyl chloride 1,1-Dichloroethene 1,1-Dichloroethene 1,2-Dichloroethene Trichloroethene	1,200 to 5.0 430 to 8.5 1,400 to 2.9 38 to 0.17 9 to 1.8	2 6 20 1 5	-100 -98 -100 -100 -80
MW-55	11/22/86	1,1-Dichloroethene 1,1-Dichloroethene Trichloroethene	210 to 33 14 to 3.7 110 to 11	6 20 5	-84 -76 -89
Deep Monitor	ing Zone:				
MW-58	01/19/87	1,1,1-Trichloroethane Trichloroethane	2.3 to 0.25 1.4 to 0.12	200 5	-89 -100
MW-59	11/18/86	1,1-Dichloroethene 1,1,1-Trichloroethane Trichloroethene	270 to 3.1 19 to 0.21 290 to 2.3	6 200 5	-99 -99 -99
NORTHWEST AF	ŒA:				
Shallow Moni	toring Zone:				
MW-1002	11/07/85	1,1-Dichloroethene Trichloroethene	2.4 to 0.96 1.1 to 0.39	6 5	-60 -65
Mi-1004	12/18/85	1,1-Dichloroethene 1,1-Dichloroethene 1,1,1-Trichloroethene Trichloroethene	120 to 23 11 to 1.6 2.1 to 0.6 14 to 3.6	6 20 200 5	-81 -85 -71 -74

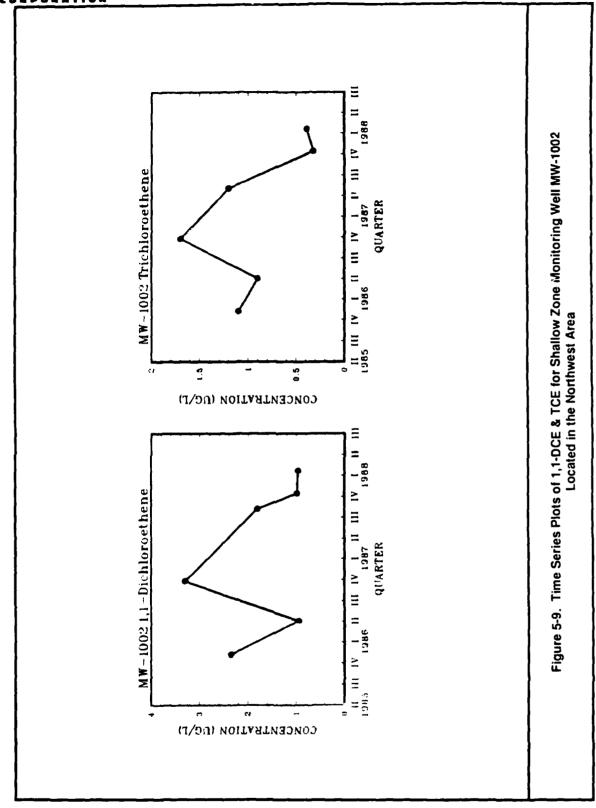
(Continued)

TABLE 5-2.

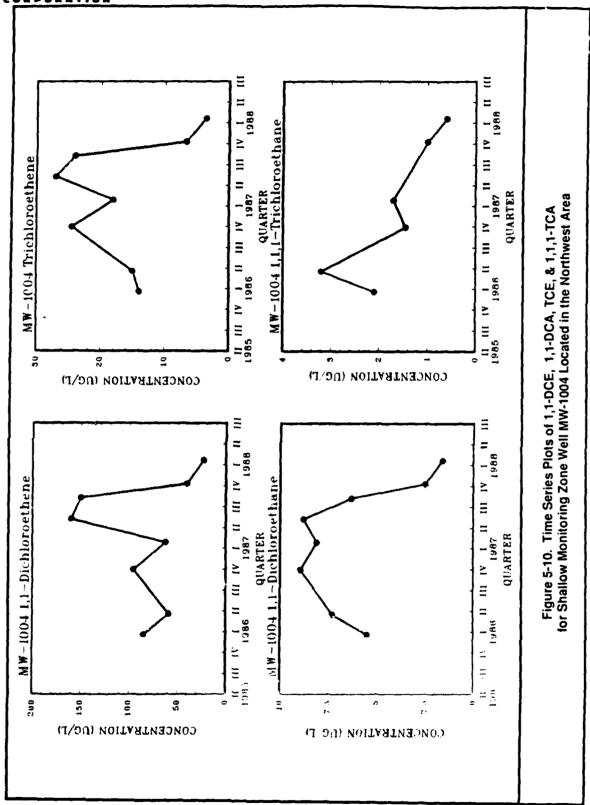
Monitoring Well Number	Initial Sampling Date	Compound	Absolute Change (ug/L)	DOHS Action Level (ug/L)	Percentage Change (%)
NORTHWEST AR	ŒA:				
Shallow Moni	toring Zone:				
MV-1005	12/17/85	1,1-Dichloroethene	160 to 58	6	-64
		1,1-Dichloroethane	41 to 5.2	20	-87
		1,2-Dichloroethane	5 to 2.2	1	-56
		Trichloroethene	100 to 15	5	-85

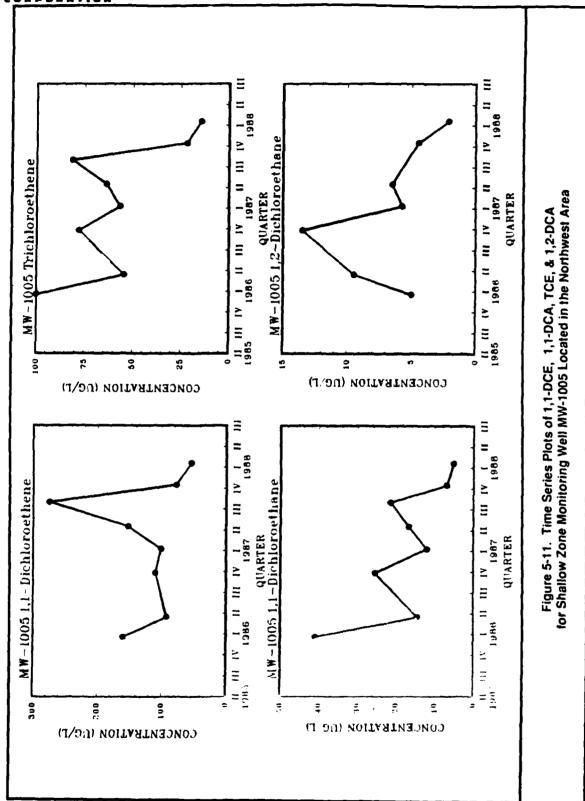


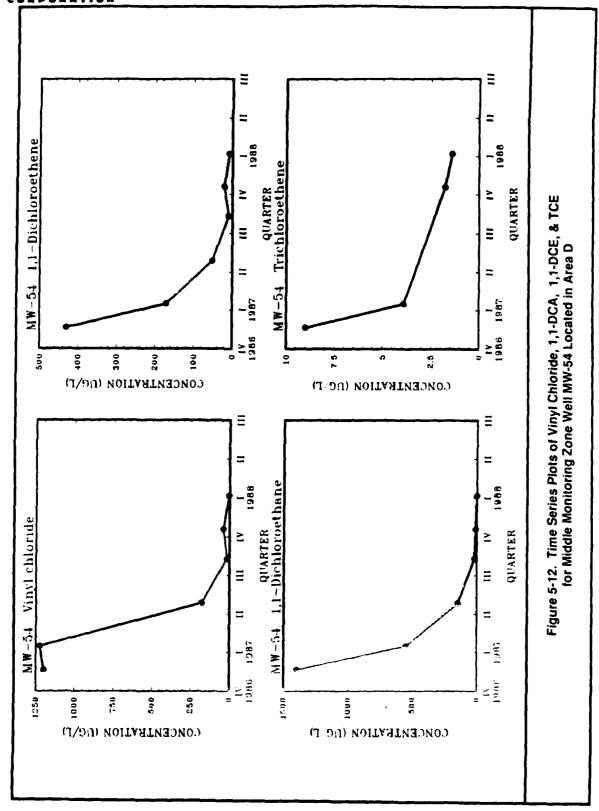


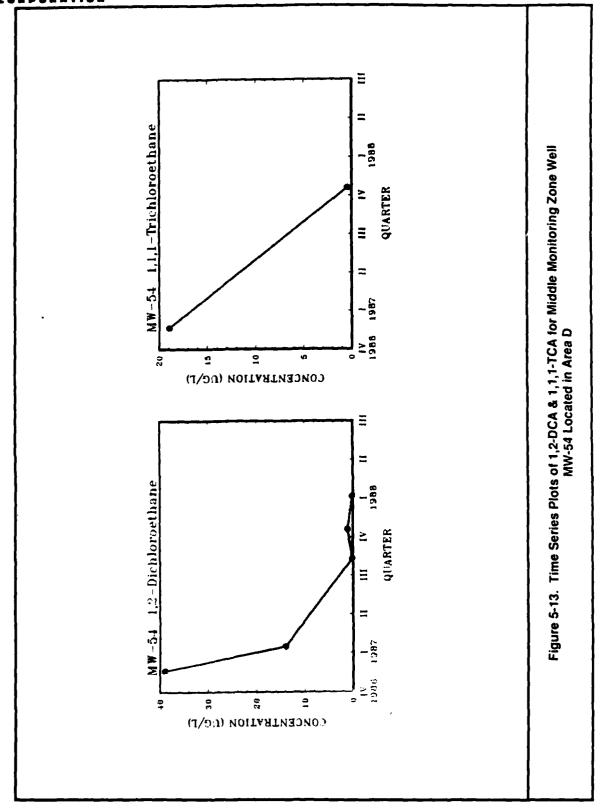




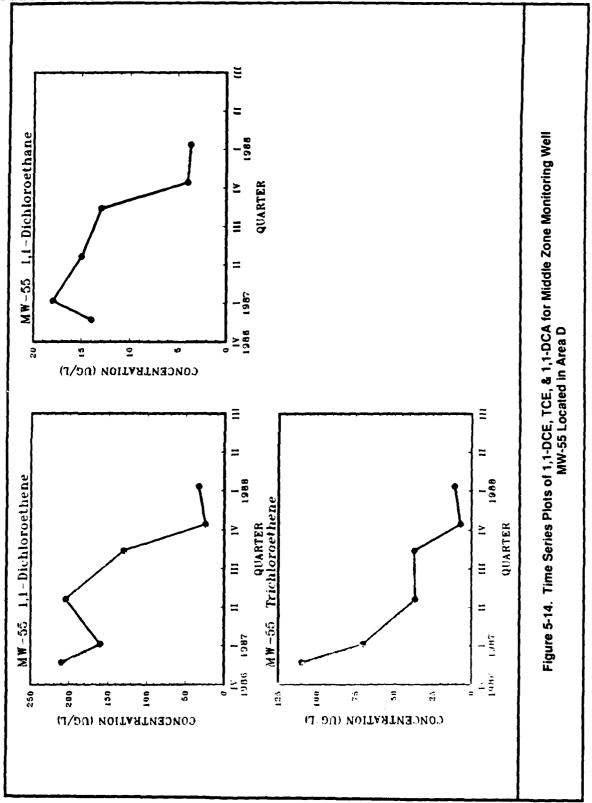






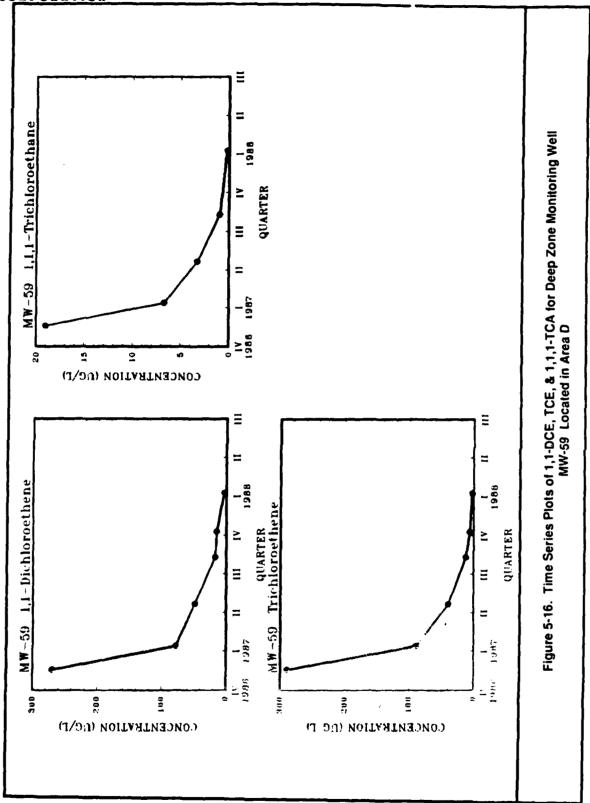






CONCENTRATION (UG/L)





contaminant concentrations have been reduced to below DOHS action levels. The column listing the absolute concentration change contains analytical results from the initial time the well was sampled on the left, and the analytical results from First Quarter 1988 on the right. The percentage change was calculated as the difference between the two values in the absolute value column divided by the higher value and multiplied by 100. The percentage change values in the table indicate the relative change for the contaminants assessed. These values show that the detected contaminants exhibited a marked decrease in concentration over the period the extraction system has been in operation.

#### 5.3.4 Conclusion

Based on the above evaluation of data, it appears that the extraction system is withdrawing groundwater contaminated with several halogenated hydrocarbons and is controlling groundwater flow in the three groundwater monitoring zones beneath and to the west of Area D. In little more than a year, concentrations have been reduced by 70 to 100 percent for most contaminants. Many of the contaminant levels in the monitoring wells are now at or below the DOHS action levels. It is expected that further decreases in contaminant concentrations will occur as the system continues to operate.

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#### 6.0 RECOMMENDATIONS

Recommendations based on analytical and hydrologic data acquired through the First Quarter 1988 are presented below.

Additional tasks are planned for the ongoing RI/FS to address several of the data limitations presented in this report (installation of additional monitoring wells, vadose zone characterization, site characterization, etc.). Therefore, specific recommendations that would be helpful for this study that will be addressed in these other RI/FS activities are not presented in this section.

1) Recommendation: Collect groundwater samples from MW-25D located in Area A and Adjacent On-Base Areas and analyze for the presence of U.S. EPA Method 601 compounds.

Rationale: Based on the direction of groundwater flow, it is probable that contaminants are migrating from Area A towards base production well BW-18. Samples collected from this middle zone monitoring well in June of 1985 contained TCE and 1,1-DCE. Contaminants detected in this well will further define the areal and vertical extent of contamination. If continued sampling is justified, this well should be redeveloped and retrofitted with a dedicated system to maintain sample integrity and reduce the chance for cross-contamination between monitoring wells. The well should be redeveloped to remove formation material (if present) and to allow groundwater to flow freely into the well casing. Installation of dedicated systems would also reduce both labor and analytical costs. Less time would be required for sampling and additional QA/QC (equipment blanks) would not be necessary.

2) Recommendation: Collect groundwater samples from MW-26D located in Area A and analyze for the presence of U.S. EPA Method 601 compounds.

Rationale: Samples collected from this middle zone monitoring well in June of 1985 contained TCE, 1,1-DCE, 1,1,1-TCA, and chloroform. MW-69, located approximately 500 feet to the north, has not detected any of these analytes. Therefore, MW-26D may be located on a preferential flow path for contaminant migration southwest of Area A. This well should also be redeveloped and retrofitted with a dedicated sampling system for the same reasons stated in Recommendation #1, should the analytical results indicate the need for continued sampling.

3) Recommendation: Collect groundwater samples from MW-64 located in Area B and analyze samples for the presence of U.S. EPA Method 601 compounds.

Rationale: This well is located east of BW-18 and will serve the same purpose as MW-25D, except that it will assess the water quality in the deep monitoring zone in this area. It should also be redeveloped and retrofitted with a dedicated sampling system for the same reasons stated in Recommendation #1, if analytical results show the need for continued sampling.

4) Recommendation: Collect field duplicates from wells that have historically shown quantitative levels of contaminants over a range of concentrations. In addition, perform laboratory duplicate analyses on the same samples.

Rationale: This is necessary so that adequate data are collected in the future for statistical analyses of total variability and so that analytical variability can be quantified as a component of total variability.

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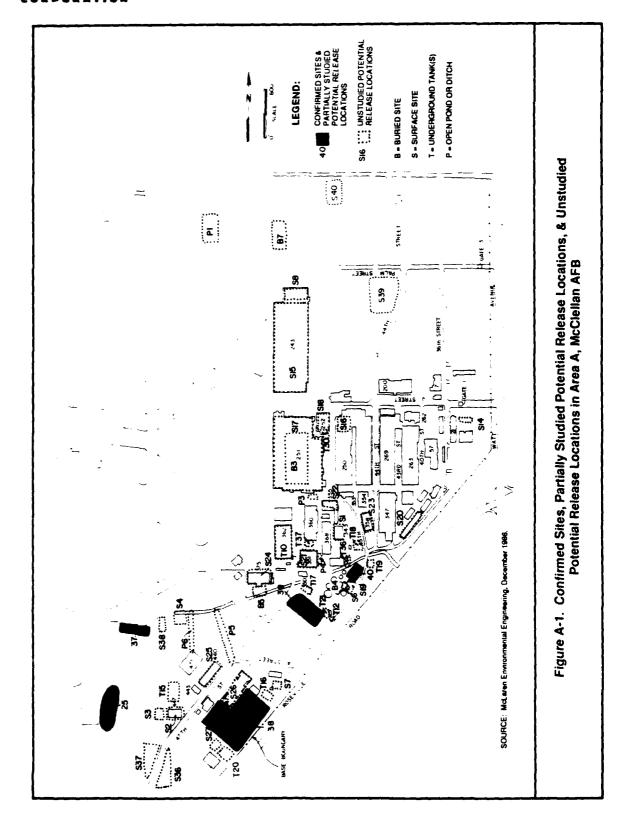
  V. 22:2047-2058. December, 1986.
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### APPENDIX A

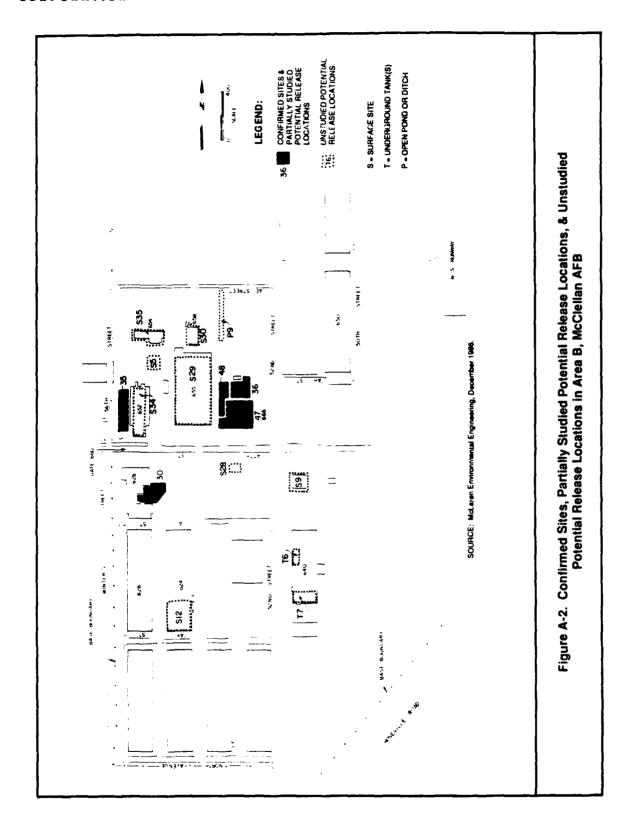
Confirmed Sites, Partially Studied Potential Release Locations, and Unstudied Potential Release Locations at McClellan AFB (Tables and Figures)

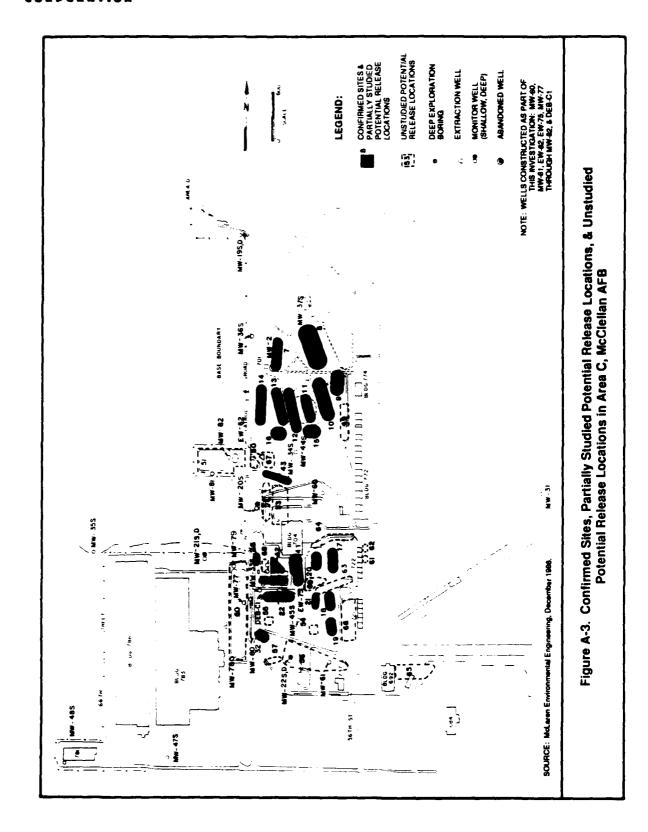




A-2

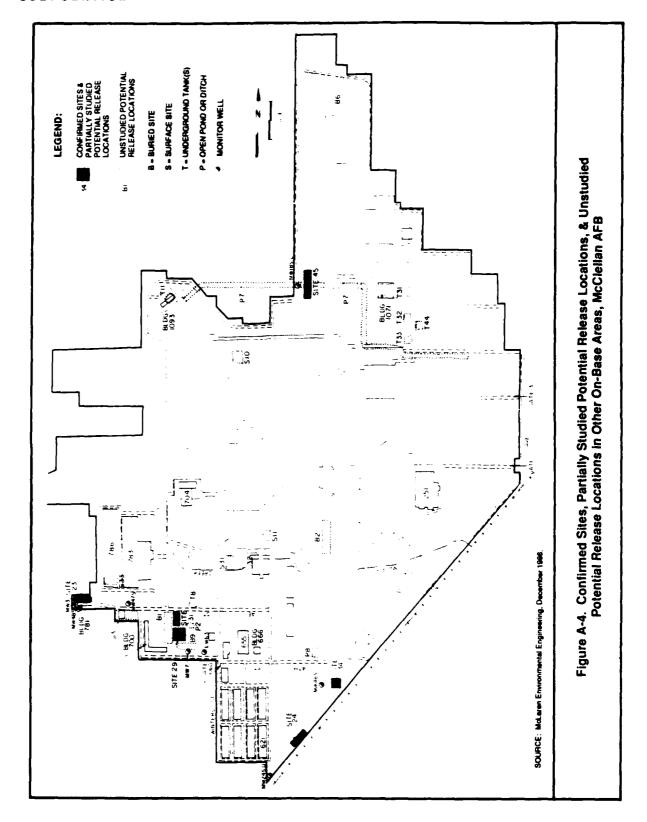






A-4







	*****************		*****************	
Site/	Description	Years of Operation	Location	Contaminant Types
		•		• •
	DJACENT ON-BASE AREAS			
	LANDFILL	40's-EARLY 50's	S END OF N/S RUNWAY	NONE DETECTED
PSPRL 37	LANDFILL	EARLY 50's	ADJ. TO TAXIWAY 7165	SOLVENTS
PSPRL 39	LANDFILL	PRE-41-46	S OF BLD 351	NONE DETECTED
PSPRL 40	INDUSTRIAL WASTEWATER SLUDGE DRYING BEDS	55-72	NE OF SANITARY WTP	SOLVENTS
SITE 38	UNDGRD TANKS/SLUDGE LANDFILL	50	BLD 475	SOLVENTS PRIORITY POLLUTANTS METALS
UPRL B-3	LANDFILL	UNKNOWN	UNDER BLD 251	SOLVENTS PETROLEUM PRODUCTS
UPRL 8-4	SLUDGE DRYING BED	UNKNOWN	S OF BLD 344	SOLVENTS METALS
UPRL 8-5	LANDFILL	UNKNOWN	S OF BLD 375	SOLVENTS PETROLEUM PRODUCTS
UPRL B-7	SPOIL AREA	UNKNOWN	N OF BLD 243	UNKNOWN
UPRL P-1	DRAINAGE DITCH/PONDS	UNKNOWN	W OF BLD878	SOLVENTS PETROLEUM PRODUCTS
UPRL P-2	WASTE POND	UNKNOWN	S OF BLD 687	SOLVENTS PETROLEUM PRODUCTS
UPRL P-3	OIL PIT	UNKNOWN	S OF BLD 251	SOLVENTS PETROLEUM PRODUCTS
UPRL P-4	SUMP	UNKNOWN	E OF BLD 351	SOLVENTS PETROLEUM PRODUCTS
UPRL P-5	OPEN DITCH	UNKNOWN	N OF BLD 475	SOLVENTS OTHER
UPRL P-6	OPEN DITCH	UNKNOWN	N OF BLD 475	SOLVENTS OTHER

IWTP = Industrial Waste Treatment Plant

UPRL ≈ Unstudied Potential Release Location

PSPRL = Partially Studied Potential Release Location



Site/		Years of	_	Contaminant
	Description	Operation	Location	Types
REA A AND A	DJACENT ON-BASE AREAS			
	PLATING SHOP	UNKNOWN	IN BLD 343	SOLVENTS
				METALS
				CYANIDE
UPRL S-2	CHEMICAL WHAREHOUSE	UNKNOWN	IN BLD 447	SOLVENTS
UPRL S-3	ACID STORAGE WRHS	UNKNOWN	W OF BLD 447	ACIDS
UPRL S-4	TREATMENT PLANT/SLUDGE BEDS	UNKNOWN	N OF BLD 431	SOLVENTS
				METALS
				PETROLEUM PRODUCTS
UPRL S-6	IWTP #1	UNKNOWN	E OF BLD 346	SOLVENTS
				METALS
UPRL S-7	INTP #3	UNKNOWN	NE OF BLD 475	SOLVENTS
				METALS
UPRL S-8	ELECTROPLATING SHOP	UNKNOWN	IN BLD 243G	SOLVENTS
				METALS
				CYANIDE
UPRL S-14	PAINT SHOP/SPRAY BOOTH	UNKNOWN	BLD 22	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-15	DEGREASER/SPRAY BOOTHS	UNKNOWN	BLD 243	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-16	SOLVENTS, PAINT, SPRAY BOOTHS	UNKNOWN	BLD 250	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-17	REPAIR SHOP/SPRAY BOOTHS	UNKNOWN	BLD 251	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-18	REPAIR SHOP/CLEANING SHOP	UNKNOWN	BLD 252	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-19	ENTOMOLOGY STORAGE AREA	UNKNOWN	NE OF SANITARY WTP	PESTICIDES
UPRL S-20	PHOTO LAB	UNKNOWN	BLD 336	SOLVENTS
				METALS
				SILVER
UPRL S-21	DEGREASER/SPRAY BOOTHS	UNKNOWN	IN BLD 351	SOLVENTS
				PETROLEUM PRODUCTS

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	265564552555555555555555555555555555555	Years of	######################################	Contaminant
	Description	Operation	Location	Types
AREA A AND A	DJACENT ON-BASE AREAS			
	REPAIR SHOP/SPRAY BOOTHS	UNKNOWN	IN BLD 355	SOLVENTS
OF RE U EE				PETROLEUM PRODUCTS
UPRL S-23	PLATING SHOP	UNKNOWN	IN BLD 358	SOLVENTS
				METALS
				CYANIDE
UPRL S-24	DEPAINT WASHRACK	UNKNOWN	AT BLD 375	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-25	TRANSFORMER SHOP	UNKNOWN	BLD 440	PCB
				SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-26	MAINT. SHOP/SPRAY BOOTHS	UNKNOWN	BLD 473	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-27	SOLV. RECOVERY STILLS	UNKNOWN	BLD 478	SOLVENTS
UPRL S-36	OIL DRUM STORAGE	UNKNOWN	N OF BLD 410	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-37	OIL DRUM STORAGE	UNKNOWN	N OF BLD 410	SOLVENTS
				PETROLEUM PRODUCTS
UPRL S-38	DRUM STORAGE	UNKNOWN	N OF BLD 431	SOLVENTS
UPRL S-39	NEU MICEIM CITE	LINKNOUM	DUDLY BLVD/PALM ST	SOLVENTS
OLKE 2.34	NEW MUSEUM SITE	UNKNOWN	DODL'I BLVD/FALM SI	SOLVENIS
UPRL T-10	SOLVENT TANK	UNKNOWN	BLD 362	SOLVENTS
UPRL T-12	WASTE OIL/SOLVENT TANK	UNKNOWN	BLD 342	SOLVENTS
UPRL T-15	TANK FARM	UNKNOWN	N OF BLD 447	SOLVENTS
				PETROLEUM PRODUCTS
UPRL T-16	TANK FARM	UNKNOWN	N OF BLD 475	SOLVENTS
		3.1.1.2.1.1		PETROLEUM PRODUCTS
UPRL T-17	TANK FARM	UNKNOWN	S OF BLD 350	SOLVENTS
				PETROLEUM PRODUCTS
UPRL T-18	TANK FARM	UNKNOWN	E OF BLD 343	SOLVENTS
2				PETROLEUM PRODUCTS

IWTP = Industrial Waste Treatment Plant

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PSPRL = Partially Studied Potential Release Location



Site/		Years of		Contaminant
ocation ID	Description		Location	Types
EA A AND A	DJACENT ON-BASE AREAS		• • • • • • • • • • • • • • • • • • • •	
	TANK FARM	UNKNOUN	E OF BLD 344	SOLVENTS
				PETROLEUM PRODUCTS
UPRL T-20	TANK FARM	UNKNOWN	SW OF BLD 475	SOLVENTS
				PETROLEUM PRODUCTS
UPRL T-21	UNDERGROUND SOLVENT TANK	UNKNOWN	W OF BLD 342	SOLVENTS
				PETROLEUM PRODUCTS
UPRL T-30	UNDERGROUND SOLVENT TANK	UNKNOWN	S OF BLD 252	SOLVENTS
	E00 041 07000100 00111 71111	I INDIVINOU IN	NEAR BLD 329	SOLVENTS
UPRL T-36	500 GAL. STOODARD SOLV. TANK	UNKNOWN	HEAR BLU JEY	JUL VEN 13
UPRL T-37	STODDARD SOLVANT TANK	UNKNOWN	S OF BLD 360	SOLVENTS
UPRL T-47	OIL/WATER SEPERATOR	UNKNOWN	E OF BLD 346A	PETROLEUM PRODUCTS
REA B AND A	ADJACENT ON-BASE AREAS			
PSPRL 30	RADIO/CHEM LAB LANDFILL	LATE 50's-EARLY 80's	E OF BLD 628	SOLVENTS
				METALS
PSPRL 35	SCRAP METAL BURIAL PIT	WWII	BLD 652	NONE DETECTED
PSPRL 36	OPEN STORAGE AREA	58-80	N OF BLD 666	SOLVENTS
r SPRE JO	OFER STORAGE RACK	<b>70</b> 00	W 6, BEB 666	CYANIDE
SITE 47	ABANDON PLATING SHOP	UNKNOWN	BLD 666	SOLVENTS
3116 47	ABANDON FEATING SHOP	OIRHOWN	565 666	METALS
SITE 48	ABANDON IWTP	UNKNOWN	IWTP#4	SOLVENTS
3112 40	ADARDON INTE	ON NOW!	• • • • • • • • • • • • • • • • • • • •	METALS
				OIL/GREASE
UPRL B-1	LANDFILL	UNKNOWN	E OF BLDG 700	UNKNOWN
		110,000	W 05 010 440	OOL WENTS
	OPEN DRAINAGE DITCH	UNKNOWN	N OF BLD 660	SOLVENTS METALS
UPRL P-9				
UPRL P·9				
UPRL P·9	IWTP	UNKNOWN	N OF BLD 652	SOLVENTS
	IWTP	UNKNOWN	N OF BLD 652	SOLVENTS METALS

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Site/	**********************	Years of		Contaminant
•	Description	Operation	Location	Types
REA B AND A	ADJACENT ON-BASE AREAS			
UPRL S-12	PCB STORAGE	UNKNOWN	BLD 624	PCB
UPRL S-13	OPEN STORAGE	UNKNOWN	BLDS 709,727,729	SOLVENTS
UPRL S-28	OIL/PAINT STORAGE	UNKNOWN	N OF BLD 600	OIL/GREASE
UPRL S-29	PCB STORAGE	UNKNOWN	IN BLD 655	PCB
UPRL S-30	DEPAINT WASHRACK	UNKNOWN	BLD 658	SOLVENTS PETROLEUM PRODUCTS
UPRL S-33	HAZ. MAT. STORAGE	UNKNOWN	BLD 786	SOLVENTS OTHER
UPRL S-34	DEGREASER/PAINT SPRAY BOOTH	UNKNOWN	8LD 652	SOLVENTS OTHER
UPRL S-35	SOLV. SPRAY BOOTH	UNKNOWN	8LD 654	SOLVENTS OTHER
UPRL S-41	MAT K DRAINAGE	UNKNOWN	S OF BLD 711	SOLVENTS PETROLEUM PRODUCTS LEAD
UPRL T-6	UNCERGROUND SOLVENT TANK	UNKNOWN	BLD 640	SOLVENTS
UPRL T-7	SOLV. PIT/WASTE THINNER TANK	UNKNOWN	BLD 640	SOLVENTS
UPRL T-8	CONTAM. FUEL TANK	UNKNOWN	BLD 756	PETROLEUM PRODUCTS SOLVENTS
UPRL T-45	OIL/WATER SEPERATOR	UNKNOWN	N OF BLD 74	PETROLEUM PRODUCTS
UPRL T-46	OIL/WATER SEPERATOR	UNKNOWN	S OF BLD 764	PETROLEUM PRODUCTS
UPRL T-48	OIL/WATER SEPERATOR	UNKNOWN	S OF BLD 765	PETROLEUM PRODUCTS
REA C AND A	ADJACENT ON-BASE AREAS			
S!TE 7	SLUDGE/OIL PIT	62-74	E OF BLD 701	PRIORITY POLLUTANTS OIL/GREASE PCB
PSPRL 8	SLUDGE/REFUSE LANDFILL	74-81	NW OF BLD 774	SOLVENTS PRIORITY POLLUTANTS

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PSPRL = Partially Studied Potential Release Location

Site/		Years of		Contaminant
	Description	Operation	Location	Types
AREA C AND	ADJACENT ON-BASE AREAS	****************		••••••••••
PSPRL 9	LANDFILL	PRE-49-53	W OF BLD 774	PRIORITY POLLUTANTS
SITE 10	LANDFILL	53-55	W OF 8LD 774	PRIORITY POLLUTANTS PCB
SITE 11	LANDFILL	55-57	W OF BLD 774	PRIORITY POLLUTANTS
SITE 12	LANDFILL	67-69	SW OF BLD 774	PRIORITY POLLUTANTS
SITE 13	LANDFILL	69-71	W OF BLD 774	PRIORITY POLLUTANTS
SITE 14	LANDFILL	71 - 74	S OF BLD 701	PRIORITY POLLUTANTS
PSPRL 15	SODIUM VALVE TRENCH	40-50	SW OF BLD 774	NONE DETECTED
PSPRL 16	SODIUM VALVE TRENCH	40.50	S OF BLD 701	NONE DETECTED
PSPRL 17	LANDFILL	57-59	SE OF BLD 704	SOLVENTS
PSPRL 18	LANDFILL	57-59	SE OF BLD 704	NONE DETECTED
PSPRL 19	LANDFILL	57-59	SE OF BLD 704	NONE DETECTED
PSPRL 20	SLUDGE/OIL PIT	56-57	SE OF BLD 704	SOLVENTS
PSPRL 21	SLUDGE/OIL PIT	56-57	SE OF BLD 704	SOLVENTS
SITE 22	BURN PIT/LANDFILL	46-68	S OF IWTP AERA. BSN	PRIORITY POLLUTANTS
				PCB OIL/GREASE
PSPRL 28	SLUDGE PIT	PRE-72	W OF IWTP	PRIORITY POLLUTANTS
PSPRL 32	RADIO/HAZ WASTE STORAGE	PRE-63-68	S OF IWTP	PRIORITY POLLUTANTS
PSPRL 41	LANDFILL	MID-40's	BLD 704	PRIORITY POLLUTANTS METALS
SITE 42	OIL STORAGE/LANDFILL	MID-40's-60's	IWTP AERATION BASIN	PRIORITY POLLUTANTS OIL/GREASE PCB
SITE 43	LANDFILL	MID-40'S	NW OF BLD 704	PRIORITY POLLUTANTS
PSPRL 49	LANDFILL	50's	NE OF BLD 704	NONE DETECTED

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PSPRL ≈ Partially Studied Potential Release Location

Site/ Location ID	Description	Years of Operation	Location	Contaminant Types			
	••••••	•					
AREA C AND ADJACENT ON-BASE AREAS							
PSPRL 50	SETTLING POND	MID-TO-LATE 50's	NW OF BLD 704	NONE DETECTED			
PSPRL 51	HOLDING POND	80 TO PRESENT	NW OF IWTP	NONE DETECTED			
SITE 52	BURN DEBRIS PIT	57	NW OF BLD 704	PRIORITY POLLUTANTS			
PSPRL 53	SETTLING POND	MID-TO-LATE 50's	NW OF BLD 704	SOLVENTS			
PSPRL 54	STORAGE AREA	MID-60's	S OF BLD 704	NONE DETECTED			
PSPRL 55	ACID STORAGE AREA/LANDFILL	MID-50's	S OF BLD 704	SOLVENTS			
PSPRL 56	STORAGE AREA	50's-60's-70's	S OF BLD 704	NONE DETECTED			
PSPRL 57	LANDFILL	50's-60's	S OF BLD 704	NONE DETECTED			
PSPRL 60	HOLDING POND	CURRENT	S OF IWTP	NONE DETECTED			
PSPRL 61	CHEMICAL WASTE PIT	54	E OF BLD 722	NONE DETECTED			
PSPRL 62	CHEMICAL WASTE PIT	54	E OF BLD 722	NONE DETECTED			
PSPRL 63	UNLINED DITCH	60's	SE OF BLD 704	NONE DETECTED			
PSPRL 64	UNLINED DITCH	60's	SE OF BLD 704	NONE DETECTED			
PSPRL 65	LANDFILL	65	E OF BLD 692	NONE DETECTED			
PSPRL 66	DITCHES AND POND	MID-60's	W OF BLD 721	NONE DETECTED			
SITE 67	LANDFILL	PRE-47	NW OF BLD 702	PRIORITY POLLUTANTS PETROLEUM PRODUCTS			
PSPRL 68	SLUDGE PONDS	40's	W OF SITE 42	PRIORITY POLLUTANTS			
SITE 69	BURN PIT	50's	SE OF BLD 704	PRIORITY POLLUTANTS			
UPRL S-11	BCE/PCE STORAGE	UNKWOWN	BLD 636	PCB SOLVENTS PETROLEUM PRODUCTS			
UPRL S-31	AIRCRAFT PAINT HANGAR	UNKNOWN	BLD 692	PAINTS SOLVENTS PETROLEUM PRODUCTS			

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### SITE/LOCATION SPECIFIC DATA, McCLELLAN AFB, CALIFORNIA

332222222	**************		=======================================	
Site/		Years of	1 4 5	Contaminant
	Description	Operation	Location	Types
AREA C AND	ADJACENT ON-BASE AREAS			
	PAINT STORAGE AREA	UNKNOWN	BLD 694	PAINTS SOLVENTS PETROLEUM PRODUCTS
	ADJACENT ON-BASE AREAS			
SITE 1	LANDFILL	59-62	NW CORNER OF BASE	PRIORITY POLLUTANTS
SITE 2	SLUDGE/OIL PIT	62-79	NW CORNER OF BASE	PRIORITY POLLUTANTS
SITE 3	SLUDGE/OIL PIT	62-65	NW CORNER OF BASE	PRIORITY POLLUTANTS
SITE 4	SLUDGE/OIL PIT	67-81	NW CORNER OF BASE	PRIORITY POLLUTANTS
SITE 5	SLUDGE/OIL PIT	72-78	NW CORNER OF BASE	PRIORITY POLLUTANTS
SITE 6	OIL BURN PIT	72-78	NW CORNER OF BASE	SOLVENTS METALS
PSPRL 27	SODJUM VALVE TRENCH	LATE 40's-EARLY 50'	s BLD 1085	NONE DETECTED
PSPRL 33	I W SLUDGE LANDFARM	72	NW CORNER OF BASE	SOLVENTS
SITE 26	SLUDGE/OIL BURN PIT	EARLY 60'S	NW CORNER OF BASDE	SOLVENTS METALS
SITE A	SLUDGE DISPOSAL PIT	60's	NW CORNER OF BASE	SOLVENTS PRIORITY POLLUTANTS METALS
SITE S	FUEL/SOLVENT/OILBURN PIT	62·68	NW CORNER OF BASE	SOLVENTS PRIORITY POLLUTANTS PETROLEUM PRODUCTS
SITE T	FUEL/SOLVENT SLUDGE PIT	64-66	NW CORNER OF BASE	SOLVENTS PRIORITY POLLUTANTS METALS PETROLEUM PRODUCTS
UPRL T-11	UNDERGROUND STORAGE TANK	UNKNOWN	BLD 1093	SOLVENTS

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#### SITE/LOCATION SPECIFIC DATA, McCLELLAN AFB, CALIFORNIA

	Description	Years of Operation	Location	Contaminant Types
THER ON-BAS				•••••
PSPRL 29	LANDFILL	50's-60's	NE OF BLD 700	NONE DETECTED
PSPRL 31	INCINERATOR ASH BURIAL PIT	63-68	NEAR BLD 680	ARSENIC
PSPRL 34	WASTE SOLVENT STORAGE TANKS	50-53	ADJ. TO TAXIWAY 7165	SOLVENTS OIL/GREASE
SITE 23	LANDFILL	66-69	BLD 781	PRIORITY POLLUTANTS
SITE 24	LANDFILL	66-69	E OF BLD 621	PRIORITY POLLUTANTS
UPRL B-6	WASTE AREA	UNKNOWN	N OF N/S RUNWAY	UNKNOWN
UPRL P-7	OPEN DITCH	UNKNOWN	NE,TO AREA D	PETROLEUM PRODUCTS
UPRL P-8	ACID AND CYANIDE PIT	UNKNOWN	S END OF N/S RUNWAY	ACID METALS
UPRL S-10	STORAGE AREA	UNKNOWN	NW OF BLD 1086	SOLVENTS RADIATION
UPRL S-40	TROOP ISSUE SITE	UNKNOWN	NW OF BLD 919	UNKNOWN
UPRL S-42	HOBBY SHOP/M&R WASHRACK	UNKNOWN	N OF BLD 1439	SOLVENTS PETROLEUM PRODUCTS
UPRL S-43	AIRCRAFT WASHRACK	UNKNOWN	NE CORNER OF MAT V	SOLVENTS PETROLEUM PRODUCTS
UPRL S-44	AIRCRAFT MAINT. AREA	UNKNOWN	S OF BLD 1071/MAT U	SOLVENTS PETROLEUM PRODUCTS
UPRL S-45	AIRCRAFT MAINT. AREA	UNKNOWN	W OF BLD 878	SOLVENTS PETROLEUM PRODUCTS
UPRL T-31	UNDERGROUND STORAGE TANK	UNKNOWN	NEAR BLD 1028	SOLVENTS
UPRL T-32	UNDERGROUND STORAGE TANK	UNKNOWN	NEAR BLD 1023	SOLVENTS
UPRL T-33	UNDERGROUND STORAGE TANK	UNKNOWN	NEAR BLD 1021	SOLVENTS
UPRL T-44	STODDARD SOLVENT TANK	UNKNOWN	NW OF BLD 1048	SOLVENTS

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### APPENDIX B

Summary of Analytical Data for Wells Containing Nine Commonly Detected Halocarbons



SIMMRY OF COMPLY DETECTED AWLYTES IN MYTTORING WELLS FROM 1981 TO 1988, MACLELLAN APB

	DONS U.S.	U.S.EPA				9	IL NIMBER						
Parameter	Action Level	Action Primary Level MCL	9-M-6	9- <del>3</del> E	<b>¥</b> +6	9	7-1-2	N4+7	子	至-7	<b>8</b> ₹	<b>9</b>	6 <del>-1</del>
Manitoring Zone			MEDILE	MIDLE	MEDIE	MEDOLE	MINITE	MEDIE	MIDLE	MEDILE	SHALLOW	SHWLOW	SWIGH
Date Sampled			12/ /81	03/ /82	10/ /84	06/13/85	12/ /81	03/ /82	78/ /60	05/31/85	12/ /81	03/ /82	12/ /81
Date Analyzed						06/18/85				06/04/85			
de.]						RAS				RAS			
rieid Amalysis Lab Analysis													
Viryl chloride	2	1	2	2	2	2	2	2	9	2	2	2	2
1,1-Dichloroethere	9	1	2	2	2	2	2	2	2	2	2	2	2
1-Dichloroethane	20	¥	2	2	2	2	2	2	2	2	2	2	2
Chloreform	100	901	2	2	2	2	2	2	8.2	5.6	2	2	2
2-Dichloroethane	H	٠	ē	2	2	2	2	2	2	2	2	2	2
1,1-Trichloroethane	200	0X	2	2	2	2	2	2	7.8	€	2	2	2
ubon tetrachloride	\$	2	9	9	2	2	2	2	2	2	2	2	2
Trichloroethare	5	٠	118	54	72	~: 88	14.4	ક્ષ	50	38.2	596	61	7.03
Tet rachloroe thene	4	된	2	Ð	2	2	2	9	2	2	2	2	2
A'L UNITS ARE UB/1													
Mi = Manitoring Well			aZ à	RADIAN = Radian Corporation, Sacramento	Radian Corporation, Sacram	Sacramento	<b>-</b>	ND = Nothing detected	detected				
			Z	Section :	Many man	EVICES	-	200	725				



SIMMEY OF COMPLEY DETECTED ANLYTES IN MENTIORING WELLS FROM 1981 TO 1988, MASLELLAN APB

	Action	U.S.EPA Primary	6 <del>-1</del>	6-1 <del>N</del>	6 <del>-1</del>	¥.	HELL NUMBER MA-10	<b>M</b> +10	M4-10	<b>M</b> +10	M-11	M4-11	<b>%</b> ₽-11
Mrnitoring Zone Date Sampled Sampled By Date Analyzed Lab Field Analysis			SHALIOH 03/ /82	SHALDA 04/ /82	78) /60 MUTWIS	94ALCH 06/16/85 RADIAN 06/19/85 RAS	SPALICH 12/ /81	SHV1.04	SHALDA 06/20/85 RADIAN 06/24/85 RAS	SHALION 10/26/87 RADIAN SAC	341104 12/ /81	31 /82 03/ /82	SEWILON 08/ /82
Vinel chlorida	,	-	9	5	9	Ş	9	9	Ş	0.8	5	8	9
1 -Dich   manch			9	2 9	9 9	2	9	<b>9</b>	5	011	9 5	1030	63000
1.1-Dichlomerhane	, <del>S</del>	<u> </u>	2 2	2 9	2 9	; <u>s</u>	2 2	36 16 16	118	30 PE	2	170	250
Chloreform	901	) 2	9	8	11.5	0.04	2	2	2	2	2	0,	2
1,2-Dichlorcethane	7	2	2	2	2	0.2	2	11	¥.7	330	2	7300	12000
1,1,1-Trichloroethane	300	900	2	2	2	ð	2	2	327	Ŋ	2	2	2
Carbon tetrachloride	ۍ	2	2	23	2	2	2	2	2	2	2	2	2
Trichloroethere	s	5	2	ส	2	134	>313	140	82	910	10.4	2100	2000
Fet rachiocoethene	4	¥	2	2	9	5	2	S	6.3	Š	2	10	2

ALL UNITS ARE ug/l

M = Monitoring Well RADIAN = Radian Corporation, Saci DAS = Bodian Aniurinal Sanda

RADIAN = Radian Corporation, Sacramento RAS = Radian Analytical Services SAC = Radian Analytical Services, Sacramento

ND = Nothing detected NE = Not established



SIMMEY OF COMPLEX DETECTED AMENTES IN HONTORING WELLS FROM 1981 TO 1988, MACLELLAN AFB

	SHOO	U.S.EPA		! !			WELL NUMBER						
Parameter	Action	Primary MC.	M+11	M4-11	<b>34</b> -12	<b>₩</b> -12	¥ <del>.</del>	<b>3</b> +12	¥+12	M-14	MH-14	M1-14	₹-17¢
Manitorine Zone			SHALLOW	SHALOW	SHALLON	SHALLOW	SHALON	SHALLON	SHWLOW	SHALOW	SHALLON	MOTMES	SPALCA
Date Sampled			06/20/85	10/27/87	12/ /81	28/ /80	28/ /80	06/19/85	10/23/87	12/ /81	03/ /82	28/ /80	06/19/85
Sampled By			RADIAN	RADIAN				RADIAN	RADIAN				RADIAN
Date Analyzed			06/24/85					06/21/85					06/21/85
4			RAS	SAC				RAS	SAC				RAS
Field Analysis													
Lab Analysis									:	;			
Viryl chloride	2	1	2	2	2	2	2	2	2	2	ສ	2	2
1,1-Dichloroethere	9	7	64300	00097	2	0027	2500	25500	11000	£	7600	17000	22600
1,1-Dichloroethare	8	更	3560	2	2	2	2	2	2	2	110	100	2
Onloroform	100	100	9	2	2	2	2	2	2	2	83	2	2320
1,2-Dichloroethare	-	۶	2	2	2	2	2	2	2	2	2	2	2790
1.1.1-Trichloreethane	200	920	18100	10000	2	2	2700	12400	3200	2	8700	3400	22800
Carbon retrachloride	'n	s	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	'n	5	11900	8000	3730	930	160	12100	4700	14100	2800	11000	26600
Terrachlomerhene	4	¥	2480	2	2	R	18	1260	082	2	2	2	2

ALL UNITS ARE ug/l MW = Monitoring Well

ND = Nothing detected NE = Not established

RADIAN = Radian Corporation, Secramento RAS = Radian Aralytical Services SAC = Radian Aralytical Services, Secramento



SLIMMEY OF COMPOSELY DETECTED ANALYTES IN MOUTICRING MELLS FROM 1981 TO 1988, MACLELLAN APR

	CORS	U.S.EP	•			3	LL NAMER						
Parameter	Act ion Level	Primacy P	y M4-14	MF-15	<b>∓</b> +15	<b>34</b> -15	M4-15	<b>₹</b> +15	<b>₩</b> +160	M+165	<b>M</b> -170	M4-170	M4-170
Monitoring Zone			SHALLOW	SHALLOW	SHALOW	SHALOW	SHALLON	MOT MAS	SHI JOU	SPM 100	, Line	MINIE	MINIS
Date Sampled			10/26/87	12/ /81	04/ /82	08/ /82	06/16/85	10/26/87	06/14/85	05/30/85	05/30/85	05/30/85	05/14/87
Sampled By							RADIAN		RADIAN	PADLAN	PADIAN	RADIAN	RADIAN
Date Analyzed							06/19/85		06/19/85	05/31/85	05/33/85	05/31/85	05/18/87
qe_]			SAC				RAS	SkC	RAS	RAS	RAS	RAS	Sec
Field Aralysis									ŀ	ļ	Ę	£	}
Lab Abalysis					:								
Viryl chloride	7	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	560	2	2980	00%	16500	1500	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	525	200	1780	ม	2	2	2	2	2
Chloroform	100	90	2	2	8	9	2	2	2	2	2	2	2
1,2-Dichloroethane	~	5	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethane	200	80	350	2	2200	2500	4100	180	2	2	2	2	2
Carbon tetrachloride	'n	S	2	2	2	2	2	2	2	2	2	2	2
Trichlomethere	5	ۍ	350	1.73	2800	3000	18000	1000	2	2	2	2	2
Tetrachloroethere	4	叟	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE UR/1													
MW = Manitoring Well			\$	DLAN = Radian	Corporat ion.	Sacramento		D = Norbine	detacted				
FIA = First field deplicate analysis	ate aralysi:	vı	\$	RAS = Radian	Analytical S	= Radian Analytical Services		NE = Not established	bl Lehed				
FIB = Second field duplicate analysis	cate analys.	t.	35	C = Radian	Analytical S	ervices. Sacr	_						

SIMMEY OF COMPLEY DETECTED ANALYTES IN HONTIDELING WELLS FRUM 1981, TO 1988, MAZELLAN APB

	DORES	U.S.EPA				9	IL NIMBER						
Parameter	Action Level		₩-139	M4-170	<b>₹</b> -170	<b>M</b> +178	M-17S	<b>№</b> -18D	<b>18</b> 190	<b>14</b> −180	<b>M</b> 4-18D	₩-180	<b>180</b>
Menitoring Zone			MEGLE	MEDLE	MEDIE	SHALLOW	SHWLOW	MODILE	MEDIE	NEEDE	KODEE	MEDIE	MEDILE
Date Sampled			08/11/87	10/22/87	01/27/88	06/05/85	06/05/85	06/14/85	03/28/86	10/01/86	01/12/87	04/29/87	08/11/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			08/11/87	10/27/87	01/29/88	06/07/85	06/07/85	06/19/85	04/01/86	10/02/86	01/19/87	05/01/87	08/17/87
4			38	35	SKC	RAS	RAS	RAS	S	SAC	S	S	<b>S</b>
Field Amlysis						Ą	922						
Lab Analysis													á
Viryl chloride	2	1	5	2	2	2	2	2	2	2	2	2	9
1,1-Dichloroethene	•	7	2	0.38C	2	2	2	2	2	2	9	2	2
1,1-Dichloroethane	ଯ	'n	2	2	2	2	2	2	2	0.13	2	2	2
Chloroform	100	901	2	2	2	2	2	2	4.0	57.0	2	2	_
1,2-Dichlorcethane	1	٠	2	2	2	2	2	2	2	2	2	2	2
1.1.1-Trichloroethene	200	800	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	Ś	S	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	5	S	2	0.390	2	2	2	2	2	2	2	9	2
<b>Tetrachlomethere</b>	4	Ä	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
MW - Monitoring Well			≱	VOIAN - Radian	Corporation,	Sacramento	-	(D = Nothing	* Nothing detected				
FIR . First field deplicate analysis	ate analysi.	ej.	2	RAS * Radian Analytical Services	Analytical S	rervices	•	C * Analyst	s confirmed tr	second colum	m analysis		
FIB = Second field duplicate analysis	cate analys	si	ð	C - Radian	Analytical 5	Pervioes, Saci	ramento	E . Not est.	barkilde				
LDA = First laboratory duplicate analysis	uplicate an	alysis											



SHAMRY OF COMPORLY DETECTED ANALYTES IN MONTORING WELLS FROM 1981 TO 1988, MCCLELLAN APR

	2035	U.S.EPA				7	TT NIMBER						
Parameter	Act ion Level	Primary M.Z.	M4-180	M+180	₩-18	M+185	M4-19D	M+190	<b>№</b> 130	₩-196	M-198	M+198	M4-200
Maultoring Zone			MIDLE	MIDLE	MIDNE	SHALLON	MIDDLE	MITTALE	MODLE	SHALLOW	SPACEOU	SHWICH	MIDNE
Date Sampled			08/11/80	10/08/87	01/22/88	06/06/85	180	08/ /80	06/16/85	06/14/85	03/13/86	10/16/86	08/
Sampled By			RADIAN	RADIAN	PADIAN	RADIAN	]	!	RADIAN	RADIAN	RADIAN	RADIAN	Į
Date Analyzed			08/11/80	10/13/87	01/25/88	06/07/85			06/19/85	06/19/85	03/19/86	10/20/86	
qe]			SAC	SK	SAC	RAS			RAS	RAS	3	SAC	
Field Aralysis													
Lab Analysis			<b>5</b>										
Viryl chloride	2	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	6.0	8.0	1.20	2
1,1-Dichloroethane	ଯ	发	2	2	2	2	2	2	2	2	2	0.190	2
Chloraform	100	92	2	2	0.100	2	2	2	2	2	2	2	g
1,2-Dichloroethane	-1	s,	2	2	9	2	2	2	2	2	2	2	Ŷ
1,1,1-Trichloroethane	300	200	2	2	2	2	2	2	2	2	2	2	2
Carbon terrachloride	ď	٠,	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	ď	2	2	2	2	1.1	2	2	2	4.3	2.6	8.23	2
Tetrachloroethere	4	Ä	2	2	2	2	2	2	2	2	2	2	2
ALL UNITES ARE 118/1													
MW = Monitoring Well			2	VDIAN = Radian	Corporation,	Sacramento		W = Norhing	detected				
LIB = Second laboratory duplicate analysis	diplicate a	ralysis	Ž	RAS = Radian Analytical Services	Analytical S	ervices		C = Analysis	= Analysis confirmed in second column analysis	nuloo braces r	m analysis		
			J.	C = Radian	Analytical	Perulyas Sary	, and	UF = Not Acts	shi ( chori				



SIMMRY OF COMPULY DETECTED AMEYTES IN MAYITORING WELLS FROM 1981 TO 1988, MAZIELLAN AFB

	ST CO	U.S.EPA				3	IL NIMBER						
Parameter	Act for Level	Primery M7.	M4-20D	M4-20D	M+30D	₩-20	MA-200	M4-200	<b>M-200</b>	M+20D	M+20	M-200	₩-200
Menitoring Zone			MIDLE	MUTAE	MIDDLE	MIDLE	MODE	MINE	MINE	MITCHE	MINIE	MITTE	MINIS
Date Sampled			78/	78/ /60	06/18/85	98/90/50	05/06/86	10/22/06	01/20/87	05/05/87	78/86/70	10/12/01	03/03/00
Sampled By			!		RADIAN	I EAF	I SAF	RADIAN	PADTAN	PADIAN	PADIAN	DATTAN	DATTAN
Date Analyzed					06/21/85	05/16/86	05/36/86	10/28/86	01/30/87	05/06/87	18/06/170	10/13/87	01/26/99
de.					RAS	AN AB	AMI AR	3	S. C.	9	<b>S</b>	Jac.	OF (27 CP)
Field Analysis					)			} !	1	ì	į	ì	ļ
Lab Aralysis						ğ	<b>8</b> 51						
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	^	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	Ä	2	2	2	2	2	2	2	2	2	2	<u> </u>
Chloroform	100	901	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane		2	2	2	2	2	2	2	2	5	£	2	2
1,1,1-Trichloroethane	200	200	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	2	2	2	2	2	2	2	2	2	2	2	S	2
Trichloroethene	s	2	2	1.4	2	2	2	9	2	2	2	2	2
Tetrachloroethere	4	Ä	2	2	2	2	<del>2</del>	2	2	2	2	2	2
AL UNITS ARE ug.  M = Menteoring Well IDA = First laboratory deplicate analysis IIB = Second laboratory deplicate analysis	plicate an uplicate z	si sylas si sylas	\$ 55 \$ \$ \$	RADIAN = Radian Corporation, Secremento USAF = United States Air Force RAS = Radian Analytical Services AUAB = Anlab Analytical lab SAC = Radian Analytical Services, Sac	Radian Corporation, Sacramento United States Air Porce Radian Analytical Services Anlab Analytical Lab Radian Analytical Services, Sacramento	Secramento oroce ervices b ervices, Secr		NO * Northing detected NE * Nor established	detected				

SIMMRY OF COMONLY DETECTED ANALYTES IN MONTIGRING WELLS FROM 1981 TO 1988, MAZELLAN APB

	SEC		5		;		WELL NUMBER	;		:			
Parameter	revel Level	T. C.	Mr-Alb	<b>4</b> +205	<b>36</b> -208	<b>302-1</b>	<b>4</b> -208	<b>1</b> 202	g <b>±</b> -50	<b>∄</b>	<b>74-</b> 210	<b>№</b> -21D	<b>₹</b> -210
Monitoring Zone			SHALLOW	SHWILDW	SHALIGH	MOTAN	SHALLOW	SHALOW	MODE	MODE	MODILE	MITTE	MINE
Date Sampled			05/ /82	28/ /80	<b>78/</b> /60	06/03/85	05/06/86	10/27/86	78/	/80	78/ /60	06/03/85	03/19/86
Sampled By						RADIAN	USAF	RADIAN				RADIAN	RADIAN
Date Analyzed						06/04/85	05/16/86	10/28/86				06/04/85	03/20/86
<b>q</b>						RAS	ANTAB	S				PAS.	3
Field Aralysis						!	!	ì				ì	3
Lab Analysis													Ą
Viryl chloride	2		2	9	2	2	2	2	2	2	£	2	2
1,1-Dichloroethere	9	~	2	2	0.3	2	4.7	0.350	2	2	2	9	2
1,1-Dichloroethane	20	¥	2	2	3.5	2	2	3.40	2	2	2	2	2
Chloraform	901	100	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethare	1	s,	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	8	2	2	1.2	3.2	2	0.91C	2	2	2	2	2
Carbon tetrachloride	ş	'n	2	2	2	2	2	9	2	2	2	2	2
Trichloroethere	Ś	S	2	2	2	2.3	3.0	2	2	2	2	8.0	2
Ter rachloroethere	7	<b>3</b>	9	2	2	2	2	0.40C	2	2	2	ð	2
ALL UNITS ARE ug/1 M4 = Mentioring Mell LDA = First laboratory duplicate analysis	plicate an	alysis	**************************************	RWDIAN = Radian Corporation, Sacramento USAF = United States Air Force RKS = Radian Aralytical Services ANIAB = Aniab Aralytical lab SKC = Radian Aralytical Lab	Corporation, States Air For Analytical Sanalytical Lal Analytical Lal Analytical Sanalytical Sanalytic	Redian Corporation, Secremento Fulted States Air Force Redian Analytical Services Anlab Analytical Lab Redian Analytical Lab Redian Analytical Services, Secremento Redian Analytical Services Secremento Redian Redia		NO = Norting detected C = Analysis confirm NE = Not established	= Nothing detected = Analysis confirmed in second colum analysis = Not established	second colum	n analysis		



SUMMERY OF COMMULY DETECTED ANALYTES IN MONITORING WELLS FROM 1981 TO 1988, MACLELLAN APR

	DOHS	U.S.EPA	MLND	M.L.21D	<b>K</b> L210	M.L.21D	WELL NUMBER	<b>K</b> 1.310	71	2	Š	2	2
Parameter	[eve]	Level MI	•	) •	)			] •	•		3	27.	C 17
Manitoring Zane			MIDIE	MIDLE	MEDILE	MIDIE	MIDILE	MICHE	MEDILE	MEDIE	SEWION	SHALOW	SHALION
Date Sampled			03/19/86	98/06/60	01/21/87	05/01/87	08/14/87	08/14/87	10/17/87	01/25/88	78/	78/	78/
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN			
Date Analyzed			03/26/86	10/01/86	01/26/87	05/05/87	08/19/87	08/19/87	10/20/87	01/27/88			
वस्			SK	Sec	Sec	Sec	Se	SS	Sk	SAC			
Field Amalysis													
Lab Analysis			9071				Š	<b>9</b> 01					
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	20	¥	ଲୁ	2	2	2	2	2	2	2	2	£	2
Aloroform	81	90	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	7	5	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlorcethane	700	500	2	2	2	2	2	2	2	£	£	2	S
Carbon tetrachloride	5	٠	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	٥	ۍ	2	2	2	2	2	2	2	2	2	2	Q
let rachloroethere	4	¥	2	2	2	2	2	2	2	2	2	2	2

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento AL (MITS ARE ug/1)
W = Monitoring well
IDA = First laboratory deplicate analysis
IIB = Second laboratory deplicate analysis

ND = Nothing detected NE = Not established

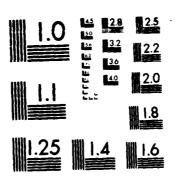
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SIMMRY OF COMPURY DETECTED ANALYTES IN MONTHORING MELLS FIRCH 1981 TO 1988, MAZELLAN APB

	DOHS	U.S.EP	*				EL NIMBER						
Parameter	Action Level	Primary MCL	3 M4-21S	<b>₩</b> ~21S	M-21S	M+21S	<b>M4</b> -21S	M-218	M+21S	M-21S	MH-21S	MH-21S	<b>№</b> -220
Manitoring 2are			SHALLOW	SHILOW	SHALLON	SPALION	SHALON	SHALOW	SHALLON	SHALLOW	SHALLOW	SHALLOW	Deep
Date Sampled			06/20/85	03/15/86	98/30/86	01/36/87	05/01/87	08/14/87	10/11/87	01/25/88	01/25/88	01/25/88	750
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	
Date Analyzed			06/24/85	03/21/86	10/01/86	02/04/87	05/05/87	08/19/87	10/20/87	01/27/88	01/27/88		
de.]			RAS	SAC	Sec	35	Sec	SAC	38	9	2	8	
Field Analysis											i	ļ	
Lab Analysis										<b>X</b> 01	807		
Virryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	20	¥	2	2	2	2	2	2	2	2	2	2	2
Chloraform	100	100	2	0.1	0.19	2	2	2	0.13C	0.16PC	0.13PC	2	2
1,2-Dichloroethane	7	2	2	2	2	2	2	2	2	2	2	2	2
1,1.1-Trichlomethane	200	300	2	2	2	2	2	2	2	₽	2	2	2
Carbon tetrachloride	ς,	\$	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	2	5	2.1	0.2	66.0	2	2	36.1	0.400	0.48PC	0.44PC	9.0	2
Tet rachloroetha e	4	¥	2	2	0.12	2	9	2	2	ð	2	2	2
ALL UNITS ARE ug/1													
MW = Monitoring Well			æ	RADIAN = Radian Corporation, Sacranento	Corporation,	Sacramento	_	(D = Nothing	detected				
LDA = First laboratory d	uplicate at	nalysis	æ	AS = Radian	Analytical S	ervices	_	3 = Amalyst	C = Analysis confirmed in second column analysis	1 second colun	m analysis		
LIB = Second Laboratory	daplicate a	analysis	ď	ES = Canonia	<ul> <li>Canonie Environmental Services</li> </ul>	al Services		or FC = Ide	attity previou	sly confirmed			
			ð	SwC = Radian	Analytical S	= Radian Analytical Services, Sacramento	٥	E = Not esta	palside	,			

F/G 24/4 UNCLASSIFIED



MICROCOPY BE OLIVER 1



SIMMER OF COMMILY DETECTED ANALTES IN MONTORING WELLS FROM 1981 TO 1988, MAZIELAN AFB

Paramen	DORS Action	U.S.EPA Primary MT.	M+220	H+220	M+220	H-220	WELL NUMBER MA-220	M+220	₩+220	M+220	M+220	M4-220	N+220
				1									
Menitoring Zere			0.00	1000	dan	da	430	2000	0.00	4331	600	66	2330
Date Sampled			28/ /80	78/ 08/	<b>18</b> / /60	06/20/85	05/06/86	10/29/86	01/23/87	05/06/87	08/06/87	10/14/87	10/14/87
Sampled By						RADIAN	USAF	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed						06/24/85	05/16/86	10/30/86	01/29/87	05/11/87	08/10/87	10/16/87	11/09/87
व्य						RAS	ANLAB	35	S	S	SKC	SK	8
Field Analysis													
Lab Analysis													
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	•	7	2	2	2	262	2	2	2	2	2	2	2
1,1-Dichlorcethere	8	2	2	2	2	16.7	2	2	2	2	2	2	2
Orloratorn	100	90	2	9	2	2	2	2	2	2	2	2	2
1,2-Dichlocoethane		S	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethane	900	900	2	1.2	1.8	133	2	2	2	2	2	2	2
Carbon tetrachloride	'n	2	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	•	s	2	1.4	2.4	213	31	2	2	2	2	2	2
Tetrachloroethene	4	Ä	2	2	2	13.5	2	2	2	2	2	2	2
ALL UNITS APE ug/1													
MV = Monitoring Well			Z	3	Corporation,	Secremento	Z	ND = Nothing detected	detected				
			USA RAS ANTA		United States Air Force Radian Analytical Services Aniab Analytical Lab	orce ervices b	Z	E = Not esta	pi ished				
			8 3	11 11	Canonie Environmental Services Radian Analytical Services. Se	Canonia Environmental Services Radian Analytical Services, Secramento	amento						

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SHARK OF ODPONY DETECTED ANNYTES IN MONTHQUIG WELLS FROM 1981 TO 1988, M-CLELAN APR

	¥8	U.S. EPA				5	LELL NAMER						
Parameter	Act ion Level	Action Primary M4-250 Lavel M3.	M+220	<b>#</b> -23	N+228	M-228	¥-228	M+230	M+230	M-230	M+230	H4-230	74-230 27-310
M. Indiana			Q.E.	CHALLOLL	GW102	ADI MES	SW104	MIDLE	MITCHE	MIDLE	MODE	MIDLE	MILE
PERMITORING FOR							9		790	100	76/10/95	03/17/9K	03/17/86
Dace Sampled			01/19/88	29 /93	<u>3</u>	<b>3</b>	98/90/50	<u>3</u>	) (S)	5	Selection of	BANTAN	DATTAN
Sampled By			RADIAN				USAP CEAP				KADIAN	MON	Sec. And
Date Analyzed			01/20/86				05/16/86				06/12/85	03/20/86	03/20/80
4			Sec				AKAB				RAS	S.	)   
Field Arelysis												¥0.	20
Lab Analysis										•			
Visual ability	,	-	9	9	9	2	2	2	2	2	2	2	2
The same of the same	4 4	• •	9	2	2	! 5	9	9	9	9	2	2	2
1,1-Dichloroemene	: ه	. !	€ !	5 i	<b>?</b> !	2 9	2 9	2 9	2 5	<u> </u>	9	2	Ę
1,1-Dichloroethane	ล	¥	2	2	2	2	2	⊋ :	<b>?</b> !	5 ;	ē i	9 9	2
Chloroform	100	9	2	2	2	2	2	2	2	2	2	⊋ !	2 4
1.2-Dichloroethane	~	•	S	9	2	2	2	2	2	2	2	2	2 :
1 1 1-Trichlomerhane	200	200	2	2	2	2	2	2	2	2	2	2	2
Carbon terrachloride	'n	·-	2	2	2	2	2	2	2	2	2	2	2
Trichlomethere	•	· •	2	80	16	47.3	38	æ	2	2	2	2	2
Ter rachloscethere	4	五	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE us/1													
Mi = Monitoring Well			2	NOIAN - Radian	n Corporation,	Secremento	~	ND = Nothing detected	detected				
FLA = First field deplicate analysis	sate analysi	2	5	SAF = United	States ALE	Porroe	~	E = Not esta	bl ished				
FIB = Second field deplicate analysis	icate analys	sis	23	RAS = Radian Analytical Services	Amalytical S	ervices							
			₹ (		Amelycical L	9							
			ň	4. = Kanna	A STATE OF THE STATE OF	COTO:	200						



SDAWRY OF COMPINY DETECTED AMEYTES IN MONTORING WELLS FROM 1981 TO 1988, HACKELAN AFB

	8	U.S.EPA					EL NAMER						
Parameter	Action	Primary M.L.	M-230	M-230	MF-230	M-20	M4-230	M+23D	M4-230	M+238	MF-236	M4-235	<b>M4-</b> 24D
Manitoring Zone			MEGLE	MEDLE	MOLE	MODE	MODE	MEDIE	MODE	SPALLOW	SHALLOW	SEWLTON	MEDIE
Date Surpled			10/16/86	01/22/87	05/05/87	08/12/87	08/12/87	10/25/87	01/21/88	78/	780	06/03/85	08/
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	!	l i	RADIAN	
Date Analyzed			10/20/86	01/28/87	05/06/87	08/18/87	08/18/87	10/29/87	01/22/88			98/90/90	
4			SAC	SAC	38	S	Sec	SkC	3			RAS	
Field Amiysis						}	}	}	ì			ì	
Lab Analysis						ğ	9						
Virnyl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichlocoethere	9	1	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethers	8	¥	2	2	2	2	2	2	2	2	2	2	2
Chlorafoan	100	9	2	2	2	2	2	2	2	2	2	2.5	2
1,2-Dichloroethare	-	s	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethere	90 7	800	0.438	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	s	'n	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	s	s	2	2	2	2	2	2	2	2	2	2.7	2
Tetrachloroethere	4	2	2	2	2	9	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
Mu = Monitoring Well				RADIAN - Radia	n Corporation	, Sacramento	_	NO = Nothing	detected				
IIM = First laboratory deplicate analysis	uplicate an	eisyle		RAS = Radian Analytical Services	Analytical	Radian Analytical Services		S = Compoure	<ul> <li>Compound detected in laboratory blank - not edited</li> </ul>	laboratory bl	ark - 1104 edi	P.	
TITE - SECURE TROOPERORY (	aplicate a	nalys is		SAC = Sadla	n Amalytical	Services, Seco	Camerico	E = Not est	blished				



SIMMEY OF COMPALY DETECTED AWAYES IN MONTHOUNG WELLS FROM 1981 TO 1988, HISTOLIAN APR

	200	U.S. EPA	_			**	T. NAMER						
Purameter	Action	Primary M.L.	M-340	<b>M</b> 4-240	M+240	<b>11</b> -20	N4-24D	144-24D	14-24D	M-240	<b>M</b> +240	MH-24D	M+245
Munitorine Zone			MINE	MOTOLE	MIDINE	MITTEL	MILE	HEDLE	MONE	MODE	MODE	MODE	MITON
Date Sambled			787	06/07/86	03/20/86	09/26/86	09/36/86	01/22/80	05/05/87	08/13/87	10/25/87	01/19/88	04/
Sempled By			! !	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	
Dace Analyzed				06/12/85	03/26/86	09/29/86	98/62/60	01/27/87	28/90/90	08/11/80	10/29/87	01/20/88	
41				RAS	38	35	SK	8	SAC	SAC	Sec	SEC	
Field Aralysis													
Lab Analysis						Ą	<b>5</b>						
Viryl chloride	2	1	9	2	2	2	2	2	2	2	2	S	Q
1,1-Dichloroethers	•	,	2	2	2	2	2	2	2	2	2	Ş	2
1.1-Dichloroethers	ล	¥	2	2	2	2	2	2	2	2	2	2	2
Polocoform	80	90	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichlocoethans	~	٠,	2	2	2	2	2	2	2	2	2	2	2
1,1.1-Trichlocoethere	8	800	2	2	2	2	9	2	2	2	2	S	2
Carbon tetrachloride	5	~	2	2	2	2	2	2	2	2	2	2	2
Trichlomethere	•	5	2	2	2	2	2	2	2	2	2	2	2
Tetrachiomethese	4	Ä	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE UR/1													
W = Monitoring Well			æ	RADIAN = Radian Corporation, Secramento	1 Corporation,	Secremento		NO = Nothing detected	detected				
DA = First .aboratony duplicate analysis	hplicate a	alxia	e.	AS - Redian	Analytical S	ervices		NE - Not est	para i de				
IJB = Second Laboratory deplicate analysis	denticate a	malvsis	v.	AC = Radian	Analytical S	ervices, Saca	Camerato						



SLAMMY OF COHOLY DETECTED ANLYTES IN HOUTINDING WELLS FROM 1961 TO 1988, HICLELAN ATS

	SEE	U.S.EPA				i	IL NUMBER						
Parameter	Act ion Level	된	y M4-24S	<b>H+</b> -24S	M+250	M+25	M+250	M+250	M+255	M-256	M4-256	M+25	M+260
Manitoring Zone			SHALLON	SHALLOW	MOLE	MEDIE	MEDLE	MEDIE	NOTIMES	SHALON	SPALOU	SHAIGU	MINIS
Date Sampled			78/ /80	06/02/85	28/ /90	28/ /80	78/ /60	06/13/85	28/ /90	08/ /82	78/ /60	05/30/85	28/
Date Analyzed				PADIAN OF 104, 195				RADIAN				RADIAN	
4				RAS RAS				Co/18/65				05/31/85	
Field Analysis Lab Analysis												ì	
Viryl chloride	2	1	2	2	9	2	2	9	9	Ş	5	5	9
1,1-Dichlocoethene	9	7	2	2	2	2	2	9	2	2	2 9	2 5	2 5
1,1-Dichloroethane	8	¥	2	2	2	2	2	2.6	2	9 5	2 9	2 5	2 5
Chloreform	100	8	2	2	2	2	2	2	9	2 5	2 5	2 9	5 5
1,2-Dichloroethere	-1	\$	2	2	2	2	2	9	9	£	2 9	2 5	2 2
1,1,1-Trichloroethane	200	8	2	2	2	2	2	2	2	2	9	2 2	2 5
Carbon tetrachloride	S	ş	2	2	2	2	2	2	2	2	2	2	2 9
Trichloroethere	s٥	٠,	2	2	2	2	2	2.9	S	2	2	2.4	2
etrachloroethene	3	Ä	2	2	2	2	2	2	2	2	2	2	2
ALL UNITES ARE UB/1													
MV = Manitoring Well			8	RADIAN = Radian Corporation, Secremento PAS = Padian Assisting Secremento	Corporation,	Sacramento	Z S	D = Nothing detected	detected				
			£		wanyt ican	EVALORES	Z	E = NOC esta	DT TRANSC				



SIMMEY OF COMPINE DETECTED ANALYTISS IN MOUTHQUIG WELLS FROM 1961 TO 1988, MICLELLAN APP.

						1	1						
	DOBS	J.S.EPA Primary	MH-260	M4-260	M+260	M+266	MH-265	MH-26S	M+26S	H+270	M-270	<b>M-27</b> 0	N4-270
Parameter	Tere!	덫								Variation 1	MINTE	MODE	MILLE
Mantoring Zone Date Sampled Sampled By Date Analyzed Lab Field Analyzed			MINIE 08/ /82	MINE 09/ /84	MIXIE 06/18/85 RADIAN 06/21/85 RAS	SHALON 06/ /82	SHALION 08/ /82	78/ /60	06/02/85 RADIAN 06/04/85 RAS	28/ /10	78/ /80	10/ /84	05/30/85 RADIAN 05/31/85 RAS
Lab Analysis									9	5	9	2	2
Viryl chloride 1,1-Dichloroctions 1,1-Dichloroctions Chloroctions 1,2-Dichloroctions 1,1,1-Trichloroctions Carbon retrachloride Trichloroctions Trichloroctions ALL UMITS ARE ug/1 Ms = Menitoring Well	7 9 2 1 10 8 9 7 7 7 8 9 7 7 8 9 9 7 9 9 9 9 9 9 9	1 / 35 00 00 00 00 35	55555555	N N N N N N N N N N N N N N N N N N N	NO N	NO N	55555555	NO N	NO N	22222222	2222222 2222222	255555	555555 <sub>3</sub> 5



SIMMEY OF CEMPORY DETECTED AMENTES IN MINITIGING MELLS FROM 1981 TO 1988, MICELLAN APR

	3	20.00											
Parameter	-		M-270	MH-270	M4-270	M4-270	<b>M</b> +270	M-270	M+270	M-275	M+275	M-275	N4-275
Monitoring Zone	1		MEDIE	MEDIE	MEDIE	MITTE	HOUSE	MIDE	MEDLE	SPALION	MOTARS	HOTIMES	35
Date Samiled			05/13/87	08/11/80	08/11/87	10/22/87	10/22/87	01/26/88	01/26/88	28/ /80	28/	28/ /80	7 <u>8</u> / 760
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN				
Date Analyzed			05/19/87	08/11/80	08/11/80	10/28/87	10/28/87	01/28/88					
3			3	3	3	38	Sec	SK	8				
Field Aralysis Lab Aralysis				Ę	<b>2</b>	AGE.	<b>8</b> 2						
Viry! chloride	2	-	2	2	£	2	Q	S	Ş	2	2	£	2
1.1-Dichlorcethene	9	,	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethane	23	¥	2	2	2	2	2	2	2	2	2	2	2
Chloroform	100	901	150	<b>8</b> .8	8.0C	8.3C	8.8C	8.30	9.5	2	2	2	6.9
1.2-Dichloroethane		ۍ	2	2	2	0.690	0.74C	0.4IC	2	2	2	2	2
1,1,1-Trichloroethere	200	8	2	2	9	2	2	2	2	2	2	2	2
Carbon tetrachloride	2	•∕1	27C	130	140	9.1C	9.60	5.10	5.9	2	2	2	2
Trichloroethere	s	s	195C	36	35	380	9	350	83	2	2	33	81.2
Ter rachloroethere	4	7	2	2	2	2	2	2	2	2	2	2	2
AL UNITS ARE UR/1													
W - Menitoring Well			¥	DIAN = Radian	Corporation,	Sacramento	-	D * Nothing	* Nothing detected				
FLA = First field deplicate analysis	aralysis		뜅		e Environment	Canonie Environmental Services	•	C * Analysis	s confirmed to	n second colu	an analysis		
The Second field deallean	a analysi.	9	Sec	C = Radian	Analytical S	ervices. Secu	_	NE = Not esta	bitshed				



SIMMEY OF COMPONY DETECTED ANALYTES IN MONTROLING MELLS FROM 1961 TO 1988, MICLELLAN AFB

Parameter	DORS Accion Level	U.S.EPA Primary MCL	M4-275	H+280	HF-280	# GR	MELL NUMBER	<b>14</b> -280	₩-280	₩-280	M4-28D	H-285	M4-29D
Menitoring Zone Date Simpled Simpled By Date Analyzed Lab Flaid Analyzis Lab Analyzis			SHALLOH OG/OS/85 RADIAN OG/10/85 RAS	MIDLE 06/ /82	MEDIALE 08/ /82	MIDGE 09/ /84	MUTALE 06/16/85 RADIAN 06/20/85 RAS	MIDIALE 05/15/87 RADIAN 05/19/87 SAC	MEDILE 08/07/87 RADIAN 08/13/87 SAC	HUDIE 10/23/87 RADIAN 10/29/87 SAC	HTDTE 01/27/88 RADIAN 01/29/88 SAC	78/ /90 NOTIMES	METALE 06/17/85 RADIAN 06/20/85 RAS FDA
		-	5	5	ç	£	g	2	2	2	2	2	2
VITAL CRIOCION	<b>,</b>	٠,	5 6	2 5	3 5	2 5	· •	9	9	9	2	2	2
1,1-Dichloroethere	٥	•	2	5 4	5 (	2 9	3		! 5	9	9	2	9
1,1-Dichloroethane	8	<u>y</u>	2	2	5	⊋ !	2 !	2 9	2 9	2 5	9	2	9
Chloraform	901	901	18.9	2	2	2	2	2	2	2 !	5 8	2 9	9
1 2-Dichlomerhane	-	•	2	2	2	2	2	2	2	2	2	2 :	2 9
1 1 1 Tel Aleman	Ę	000	5	2	2	2	2.5	2	2	2	2	2	2
Cold and delice	,	,	9	2	2	2	2	2	2	2	2	2	2
The state of the s	, «	, ,	3 5	9	. 2	2	6.6	2	2	2	2	2	2
Tet rachlomethere	1 4	, <u>w</u>	2	2	2	2	2	2	2	2	2	2	2

AL UNIS ARE ug/l M4 = Minitoring Well FDA = First field diplicate analysis

RADIAN = Radian Corporation, Secremento ND = Nothing detected RAS = Radian Analytical Services NE = Not established SAC = Radian Analytical Services, Secremento



SIMMEY OF COMONLY DETECTED ANALYTISS IN MONITORING MELLS FROM 1981 TO 1988, MAZELLAN APB

Parameter	DONS Action Level	U.S.EPA Primary MCL	I <del>4</del> -20	<b>14</b> -240	₩+290	M-290	ELL NIMBER NJ-240	N4-29D	M+290	W+240	<b>74</b> -29	M+-240	<b>₩</b> -29
Menitoring Zone Date Sempled Sempled By Date Analyzed Lab Field Analyzis Lab Analyzis			MIXILE 06/17/85 RADIAN 06/19/85 RAS FTB	MIDDLE 04/03/86 04/03/86 04/25/86 SAC FDA	MIDDLE 04/03/86 04/08/86 SAC FTB	MIDILE 10/01/86 10/02/86 SAC	MIDITE 01/15/87 RADIAN 01/21/87 SAC	MULLE 04/23/87 8ADUN 05/01/87 SAC	MEDIE 04/29/87 RADIAN 05/01/87 SAC	MIDDLE 08/12/87 RADIAN 08/18/87 SAC	MIDITE 10/24/87 RADIAN 10/29/87 SAC	MIDDLE NO.1/19/88 NA.12AN SA.C.	MUDILE 01/19/88 RADIAN
Viryl chloride 1,1-Dichlocochene 1,1-Dichlocochene Ghlocochone 1,2-Dichlocochene 1,1-Tichlocochene Carbon tetrachlocide Trichlocochene Tetrachlocochene	200 100 200 4 5 7	1 / N	222222222	22222222	222222222	22222222	22222222	222222222	22222222	22222222	2222222	22222222	22222222

ALL UNITS AND ug/1

M = Munitoring Well

FIA = First field deplicate analysis

FIB = Second field deplicate analysis

LIA = First laboratory deplicate analysis

LIB = Second laboratory deplicate analysis

RADIAN = Radian Corporation, Serramento
RAS = Radian Analytical Services
CES = Carante Environmental Services
SAC = Radian Analytical Services, Secremento

ND = Nothing detected NE = Not established



SIMMER OF COMPOUND DETECTED ANALYTES IN MONTORING WELLS FROM 1981 TO 1988, MATELLAN AFB

	90	U.S.EPA				3	SL NIMBER						
Parameter	Act ion Level	on Primary M I MCL	M+30S	M-31S	M#-31S	M+31S	<b>14-33</b>	MH-31S	MM-31S	M4-31S	M+31S	<b>H</b> -318	<b>74</b> -315
Menitoring Zone			SHALLOW	SEWICE	NOT MAD	SEW 104	COLMAN	GW 102	SW101	GRAF I CL	DOI MAD	OUR LOT	CHAILC
A . L													
nace sembred			06/13/85	06/11/85	03/28/86	10/08/86	10/08/86	01/22/87	04/29/87	08/17/87	10/27/87	01/27/88	01/27/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			06/18/85	06/18/85	04/01/86	10/10/86	10/10/86	01/28/87	05/01/87	08/18/87	10/30/87	01/29/88	01/29/88
<b>વ</b>			RAS	RAS	S	Sec	S	9	S	S	S	S	S
Field Analysis					ľ	}	}	l I	1	}	}	}	<u>}</u>
Lab Aralysis						<b>Y</b>	<b>9</b>					4	<b>9</b>
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	٧	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	Ä	2	2	2	2	2	2	2	2	2	2	2
Chloreform	100	90	2	2	0.1	2	0.12	2	2	2	2	2	2
1,2-Dichloroethare		S	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethme	30 30	900	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	5	~	2	2	2	2	2	2	2	2	2	2	2
Trichlowethere	ς,	٠,	Ē	2	2	2	2	2	2	2	2	2	2
Tetrachlomerhere	4	¥	9	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
MW = Menitoring Well			2	RADIAN - Radian	1 Corporation,	Sacramento	-	ND = Nothing	detected				
LDA = First laboratory deplicate analysis	hplicate an	alysis	2	S - Radia	- Radian Analytical Services	ervices	_	NE = Not established	blished				
LTB = Second laboratory	dplicate a	enalysis	ð	C = Radian	Radian Analytical Services Secretary	Pervices Sec	attent o						



SIMMEN OF COMPILY DETECTED AMLYTES IN MONTROLING MELLS FROM 1981 TO 1988, MACLELLAN APB

ı	DORS Action	U.S.EPA Primacy	M+335	M4-33S	M+335	M-335	WELL NUMBER	M+33S	M+335	M+336	<b>K</b> F-335	M+33S	MH-335
Parameter	[eve]	렃								!			
Manitoring Ane			SHALLOW	MOTOMAS	SHALION	SHALOL	SHALON	MOTANS	POTANS	MOTIVES	SHIDN	SWICE	SWIG
Date Sampled			78/ /60	78/ /60	06/07/85	06/07/85	05/06/86	10/30/86	01/29/87	01/29/87	04/16/87	04/16/87	07/31/87
Sampled By			!		RADIAN	RADIAN	USAF	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADIAN
Date Analyzed					06/12/85	06/12/85	05/16/86	11/03/86	02/03/87	01/30/87	04/11/87	04/17/87	08/05/87
4					SAS.	ZWS.	ANA	SK	3	35	SS	3	Š
Field Analysis Lab Analysis					é	<b>2</b>			ĕ	<b>9</b> 2	<b>E</b>	<b>3</b> 2	<b>É</b>
Viry! chloride	2	1	2	2	2	2	2	2.3r	310	Ę	1001	101	2
1,1-Dichloroethere	•	^	2	2	2	2	2	2. GPC	4.1C	79.7	2	2	2
1,1-Dichloroethare	8	Ä	2	2	2	2	2	2. AIC	 90	5.90L	8. 10E	8. IDE.	2
Chloroform	100	8	٠	2	2	2	45	28	33	3	<del>Q</del>	2	2
1,2-Dichloroethane		S	2	2	2	2	Я	289	<b>28</b>	χ Σ	2	2	2
1,1,1-Trichloroethare	200	8	2	2	2	2	2	2	2	0.270	0.4 <b>21</b>	0.27UL	280C
Carbon tetrachloride	s	s	2	2	2	2	2	2	2	2	0.4101	0.3LDL	2
Trichloroethere	\$	s	2000	17500	22600	21500	29000	25000C	22000C	27000C	2500C	24000C	72000C
Fet rachlomethere	4	2	2	2	2	2	2	2	2	9.80	8.7 <u>7</u>	8. E.	2
ALL UNITS APE UR/1													
M4 = Manitoring Well FIA = First field deplicate analysis	te analysis	_		RADIAN = Radian Corporation, Secramento USAF = United Scates Air Force	Corporation	Secremento Force		NC = Result	was not confidence	Result was not confirmed in second column analysis Nothing detected	d colum eral	કોક્ષ.	
rib = Secard field diplic	rate analysi	2		ANIAN - Radian ANIAN - Anlab	Radian Analytical Services Anlab Analytical Lab Badian Analytical Services Servicents	Services ab	c the	NE = Not est	Dillies of or or or Not established	continuenton r	s		



SIPPARY OF COPPORTY DETECTED ANALYTES IN PORTICEING WELLS FROM 1981 TO 1988, PACLELLAN APB

	Action 1	U.S.EPA Primary M2.	M-33S	M4-33S	M+33S	M+335	HELL NUMBER H4-36S	M4-365	MH-36S	SS. +₹	74-36S	M+365	H+36S
Mentoring fore Date Sampled Sampled By Date Analyzed Lab Field Analysis			SHALLON 07/33/87 RADJAN 08/05/87 SAC FTB	SHALOH 09/17/87 RADIAN 09/21/87 SAC	SHALICH 10/26/87 RADIAN 10/29/87 SAC	SEMILON 01/08/88 RADIAN 01/11/88	28/ /60	180 MB 160	SHALIGH OG/OG/BS RADIAN OG/O7/BS RAS	94A1D4 03/31/86 740038 04/03/86 SAC	SHALION 09/17/86 RADIAN 09/23/86 SAC	SHALOH 01/14/87 RADIAN 01/20/87 SAC	SHILDH O4/16/87 RADIAN O4/17/87 SAC FDA
Viryl chloride 1,1-Dichloroetere 1,1-Dichloroetere Glioridom 1,2-Dichloroetere Carbon tetrachloride Trichloroetere Tetrachloroetere Tetrachloroetere	2 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5.10 3.10 3.10 4.21 4.21 14.01 4.21 2.21 2.20 2.20 2.21	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	8888888	55555555	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5 5 5 5 5 5 5 5 ° 5 5	0.00C NO NO NO NO NO NO 2.2C 0.13C	22222222	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6
AL UNIS AR ug/1 M = Mentoring Well FD = First field deplicate analysis FD = Second field deplicate analysis	ate aralysicate araly	al sis		RADIAN = Radian Corporation, Sacramento RAS = Radian Aralytical Services SAC = Radian Aralytical Services, Sa	= Radian Corporation, Sactamento = Radian Analytical Services = Radian Analytical Services, Sactamento	1, Sacramento Servioes Servines, Sa	одышел	NC = Result was not confirmed in second (ND = Nothing detected II. = Plinted out of the confirmation run P or FC = Identity previously confirmed NE = Not established	NC = Result was not confirmed in second column analysis ND = Northing detected IL = Diluted out of the confirmation run P or PC = Identity previously confirmed NE = Not established	rmed in secon confirmation r usly confirms	d colum eral un d	sisy	



SIMMEN OF COMPANY DETECTED ANALYTES IN MONTHORING WELLS FROM 1981 TO 1988, MACLELLAN APB

Marticorters	101.004 17 07/30/87	M+365	¥4-365	£-1	MH-396	S07-14	S07-4M	M-405	<b>H4-</b> 41S	200
\$ Zene led    red   red				) !			!			ST T
red		SWID	SPALICE	MODE	SHATON	SHALOU	SHALOW	SHALON	SHALOU	POTMES
ysts		10/21/87	01/13/88	06/19/85	28/	28/ /60	78/ /60	06/02/85	28/ /60	06/10/85
read   1		RADIAN	RADIAN	RADIAN				RADIAN		RADIAN
sts  tide 2 1  cettere 6 7  cettere 20 NE  cettere 100 100  cettere 100 200  cettere 20 200  addiocide 5 5  fere		10/23/87	CD / 17/88	06/21/85				06/04/85		06/12/85
1551.5   1		<b>3</b>	3	RAS				SAS		SAS
tide 2 1 2 tectors 6 7 2 cectors 6 7 2 cectors 100 100 2 cectors 10 5 3 cectors 20 200 2 cectors 20 5 3 cectors 5 5 3 cectors 5 5										
octubers         6         7           octuber         20         NE           100         100         100           octuber         1         5           lower barre         20         200           action ide         5         5           near         5         5	2	2	2	2230	2	2	2	2	2	2
20 NE 100 100 certaire 20 NE 100 certaire 1 5 100 200 action idea 5 5 5 series 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	2	5	0.24C	11500	2	£	2	2	s	2
100 100 Declarate 1 5 Increations 200 200 achiloride 5 5	2	2	2	4430	2	2	2	2	2	2
1         5           Iomethane         200         200           achloride         5         5           nene         5         5	2	0.200	2	2	2	2	91	13.5	2	2
table 200 200 ide 5 5	2	2	2	300	2	2	2	2	2	2
ide s s	2	2	2	1870	2	2	2	2	2	2.3
5 5	2	2	2	2	2	2	2	2	2	2
	5.30	1.80	1.90	<b>5</b> %	2	5	8.4	190	8	23.2
Tetrachloroethene 4 NE ND	2	0.35C	2	980	2	2	2	2	2	3.3
_	RADIAN = Radian Corporation, Secremento	Corporat ion,	Secremento		ND = Nothing	detected	= Nothing detected			
FIB = Second field deplicate analysis RAS	RAS = Radian SAC = Radian	Radian Amalytical Services Radian Amalytical Services, Secramento	ervices ervices, Secr	amento	C = Analysis confin NE = Not established	s confirmed in ablished	n second colu	m æslysts		



SLAWRY OF COMPLY DETECTED AWLYTES IN HOUTTORING WELLS FROM 1981 TO 1988, HICKLEAN AFT

	Ę	8				1	N WASES						
Parameter	Action Level	Primary MT.	MF-41S	<b>M</b> +41S	MF-41S	S17-418	M4-415	<b>M</b> -418	MH-41S	MH-41S	SI7-418	<b>14-418</b>	M-41S
Manitoring Zare			SHALLON	SHALOW	ADT/MES	MOTANS	SHALLOW	SWIDE	SHATON	SHALON	MOTANS	SPATOL	SHICH
Date Sampled			03/13/86	11/18/86	11/18/86	01/15/87	01/15/87	04/24/87	04/24/87	08/02/87	10/20/87	10/20/87	10/20/87
Sempled By			PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			03/19/86	11/21/86	11/21/86	01/22/87	01/22/87	04/28/87	04/28/87	08/07/87	10/22/87	10/27/87	11/24/87
4			S	Sec	SKC	3	S	38	SAC	360	35	3	R
Field Aralysis Lab Aralysis				Ą	Ē	Ą	<b>8</b>	<b>4</b>	95		<b>30</b>	Ą	Ę
Viryl chloride	2	-	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	^	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethans	8	¥	2	2	2	2	2	2	2	2	2	2	2
Onlorofoun	8	8	1.4	1.10	2	1.00	1.00	1.60.	1.400	1.00	1.4C	1.00	2
1,2-Dichloroethers	-	~	2	2	2	2	2	0.990	0.28DL	2	2	2.30	2
1,1,1-Trichloroethere	200	â	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	٠,	2	2	0.250	2	S	0.71DL	0.550	2	2	2	2
Trichloroethere	'n	•	ន	O#	730	370	3,0	216	208	1300	100C	810	110
Tetrachlocoethere	4	¥	9.0	0.18DL	2	2	2	0.7 <b>SDL</b>	0.74DL	2	2	3.82	2
ALL UNITS ARE UE/1													
FOR = First field challe.	rate and wei		2 0	Manuel = Ranian (Opporation, Sacramatic (SS = Carrate Froi manage) Sandon	Manual Orporation, Secretarion	'al Services			oetected . confirmed in	NOTIMING CONTROLLED.  Amalysis confirmed in second column analysis	and seed on		
WR = Second field deal cate analysis	cate analys	, .	1 7		- Amelian Inc.	Parlim Analysical Sections Sections		T. Dillegal	2 of the 2	Ollect at of the antimeter as			
Taken orders and a second		1	3	1		KIVILES, JA		1			<b>=</b>		

M = Mentoring Well
 First field deplicate analysis
 First laboratory deplicate analysis
 LDA = First laboratory deplicate analysis
 LB = Second laboratory deplicate analysis

ND = Nothing detected
C = Analysis confirmed in second column analysis
IL = Diluted out of the confirmation run
NE = Not established



SIMMER OF OTHER RETISTED ANALYTES IN MUTTIPLING WELLS FROM 1961 TO 1986, MICLELAN AND

	SHOO	U.S.EPA				3	17. NUMBER						
Parameter	Act ion Level	tion Primary Ma-	MH-41S	<b>H</b> -418	<b>W</b> +428	¥-€3	₹57- <del>1</del>	SE7- <b>™</b>	M+438	M+445	<b>M-44</b> S	S#1-44S	S\$7-4W
Manitoring Zone			SHALLON	MICH	SHWIGH	SWICH	SHALON	SHALLOW	SHATON	SHION	SHALON	SEWLOW	SPALLOW
Date Sampled			01/36/88	01/26/88	28/ /60	06/02/85	06/02/85	28/	05/31/85	28/ /60	<b>48/</b>	03/21/86	98/11/60
Sampled By			RADIAN	RADIAN		RADIAN	RADIAN		RADIAN			RADIAN	RADIAN
Date Analyzed			01/28/88			06/04/85	06/10/85		06/04/85			04/01/86	09/23/86
qej			Sec	8		RAS	RAS		RAS			S	Sic
Field Amlysis Lab Amlysis						Ę	<b>6</b> 2						
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichlocoethere	9	7	9	Q	2	2	2	2	2	æ	2	2	0.550
1,1-Dichloroethere	ន	¥	2	2	2	2	2	2	2	2	2	2	2
Chloreform	001	8	0.92FC	1.4	2	2	2	2	2	2	2	2	2
1,2-Dichloroethans	-	<b>ب</b>	2	2	2	2	2	2	2	2	2	2	2
1.1.1-Trichloroethere	200	8	2	2	2	2	2	2	2	2	-	2	2
Carbon terrachloride	'n	×	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	•	•	140PC	190	2	0.7	2	2	2	1.0	1.2	2	2
Tetrachioroethere	4	¥	6.2PC	6.4	2	2	2	₽	2	2	2	2	2
ALL UNITS APE ug/1													
M = Menteoring Mell			æ	ž	1 Corporation,	Secremento	-	ND = Nothing detected	detected				
FDA - Pirst field deplic	ate aralysi	wi.	æ	RAS = Radian	<ul> <li>Radian Analytical Services</li> </ul>	recvioes	-	C = Analysi:	¥	in second column analysis	m analysis		
FIB = Second field deplicate analysis	cate analys	si.	U	•	· Cancelle Environmental Services	al Services	_	Por R = Id	exity previo	usly confirms	75		
			S	SAC = Radian	Analytical S	Redian Analytical Services, Secrement	٥	E = Not est:	blished				



SIMMER OF COMPANY DETECTED AMANYES IN MANTHOLING WELLS FROM 1981 TO 1988, MICLELLAN APR

	<del>20</del>	U.S.EPA					T. N. MER							
Paramter	Act lon Level		M-44S	<b>M1-44</b> S	<b>M+</b> -44S		<b>H</b> -482	<b>M-4</b> 45	M+456	957-12	<b>W</b> 1-46S	S97-7K	2473	S
Monitorine Zone			HOTIMAS	SPATON	SWILLOW	SHALON	SHALLOW	HOTHES	MOTIMES	SHALLON	SHALON	SHILD	SHILD	3
Date Sampled			01/12/87	05/06/87	08/13/87	10/23/87	10/23/87	01/22/88	06/04/85	98/90/90	28/ /82	06/03/85	8	8
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	(EAF		RADIAN		
Dace Analyzed			02/05/87	05/11/87	08/18/87	10/29/87	10/29/87	01/26/88	06/05/85	05/16/86		06/04/85		
4			Sec	SK	3	38	Se	SKC	RAS	AKAB		RAS		
Field Analysis														
Lab Aralysis						Š	<b>9</b>		,					Ì
Virwi chloride	2	1	2	2	2	2	2	2	2	ð	2	2	2	
1.1-Dichloroethere	٠	_	2	2	35.50	3.30	3.30	3.30	2	2	2	2	2	
1.1-Dichlocoethane	ଯ	2	2	2	2	2	2	2	2	2	2	2	2	
Ohloroform	8	100	9	2	2	2	2	2	2	2	\$	2	2	
1.2-Dichloroethane	-	•	2	2	2	2	2	2	2	2	2	2	2	
1.1-Trichlomethere	002	200	9	2	2	9	2	2	2	2	2	<u>Q</u>	2	
Carbon retrachloride	·-	5	9	2	2	9	2	2	2	2	2	2	2	
Trichloroethene	•	•	9	9	2	0.400	0.440	0.630	4.1	41	2	2.7	2	
Tecrachloroethere	•	2	2	2	2	2	2	2	2	Q	2	Q	2	
ALL UNITS ARE UE/1														i
M = Manitoring Wall			a2 :	ADIAN - Radia	Corporation	Secremento		NO = Northing	detected	1	1			
IDA = First laboratory deplicate analysis IDA = Second laboratory deplicate analysis	hplicate a	nalysis nalysis	<b>⇒</b> 22	USAF = United States Air Porce RAS = Redian Analytical Services	States Air	Force		C - Analysi	C = Aralysis curtified in secret column apartysis NE = Not established	ingo dinose u	in analysis			
		Ì	: ₹	dela - Anlah	Analytical L	4								
			ď	AC = Radian	Analytical :	Services, Sect	ranguro							



SIMMEY OF COMPLY DETECTED ANALYTES IN MATTORING WELLS FROM 1981 TO 1988, HICLELAN AFB

Pazareter	DONS Action Level	U.S.EPA Primary MC.	SL7-4N	967- <b>19</b>	M4-51	H-51	HELL NAMER HAPSI	M-51	<b>16-</b> -51	14-51	15- <b>15</b> 1	M4-51	25 <del>1</del>
Menitoring Zone Date Sampled Sampled By Date Analyzeti Lab Field Analysis Lab Analysis			SHVLCU 06/04/85 RADIAN 06/05/85 RAS	78/ /60 NOTINES	DESP 02/ /84	11/2/96 11/2/96 11/2/96 11/2/96 SAC	DEEP 01/14/87 RADIAN 01/19/87 SAC	DESP 04/23/87 PACIAN PACIAN SAC	1829 08/03/87 18401AN 08/06/87 SAC	10/15/87 10/15/87 RWDIAN 10/19/87 SAC	1222 01/11/88 01/12/88 01/12/88 SAC FDA	DEEP 01/11/86 RADIAN 01/12/88 SAC FIB	METER 64, /84
Virwl chloride	2	-	2	2	2	2	2	2	2	2	2	9	2
1 1-Dichlomerhane	ve	,	9	9	18	2	2	2	2	2	2	2	2
1 -Dichloroethans	8	9	9	2	2	2	2	2	2	2	2	2	2
Chloreform	100	9	2	2	2	2	2	2	2	2	2	2	2
2-Dichloroethane		'n	2	2	2	2	2	2	2	2	2	2	2
1.1.1-Trichlomethane	500	900	2	2	6.0	2	2	2	2	2	2	2	2
Carbon retrachloride	·	·	2	2	9	2	2	2	2	2	2	2	2
Trichlomethere	, .	·	2	2	1.4	2	2	2	2	2	2	2	2
let rachlomethere	-	<b>2</b>	2	2	2	2	2	2	2	2	2	2	2
ALLUTS AE ug/1 M = Maritoring sell FDA = First field deplicate analysis FDB = Second field deplicate analysis	ate ambysi Leate ambysi	1 3	223	OIAN = Radia NS = Radia NC = Radia	n Cosporation n Analytical n Analytical	RADIAN = Radian Cosporation, Sectemento RAS = Radian Amalytical Services SAC = Radian Amalytical Services, Sectemento	Camparation	E - Nothing detected E - Not established	detected				

B-28



SIMMER OF COMPLEX DETECTED ANLYIES IN HORTODIC WELLS FROM 1961 TO 1988, HICLELAN APP

	<b>S</b>	U.S. EPA				3	L. NURER						
Parameter	Action Lavel		₩.	<b>14</b> -52	¥+8	7 <del>4</del> -52	¥-	<b>14</b> -52	₩-53	<b>#</b> -53	₩+33	MH-53	M+53
Munitoring Zone			MODE	MEDLE	MEDICE	MODE	MEDITE	MINITE	MODILE	MITCHE	MINE		3 244
Date Sampled			11/24/86	01/29/87	05/11/87	07/27/87	10/16/87	01/07/88	78/	11/21/86	01/20/87	05/08/80	07,28/87
Sampled By			RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN		RADIAN	PADTAN	RADIAN	PATTAN
Date Analyzed			12/01/86	01/29/87	05/13/87	07/28/87	10/19/87	01/08/88		11/25/86	01/22/87	05/12/87	07/29/87
₹ 1			SK	3	3	Sec	SAC	SKC		Sec	SKC	S	3
Field Aralysis Lab Aralysis													
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	9	£
.,1-Dichloroethere	ø	7	2	2	2	2	2	2	6.8	2	2	9	2.10
,1-Dichloroethane	8	Ä	2	5	2	ð	2	2	0.6	2	2	9	2
Chloroform	81	8	2	9	2	2	2	2	2	2	2	2	2
,2-Dichloroethans	-4	٠,	2	2	2	2	2	2	2	2	2	2	2
l,l,l-Trichlomethere	200	8	2	2	2	2	2	2	3.0	2	£	2	2
Carbon tetrachloride	٠,	•	2	5	2	2	2	2	2	2	2	2	2
<b>Frichloroethere</b>	'n	•	₽	2.10	2	2	2	2	8.0	2	2	2	2
Tetrachloroethene	4	2	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
MW = Monitoring Well			R	RADIAN = Radian Comporation, Secramento	Comorae ton,	Secramento	z	D = Nothing detected	detected				
			•	:									

ND = Nothing detected C = Analysis confirmed in second column analysis NE = Not established

RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Sectemento



SIMMER OF COMPULY DETECTED AWAYTES IN MONTHQUIRG WELLS FROM 1981 TO 1988, MCCLELAN APB

	SHDO	U.S.EPA	67-77	<b>1</b>	15-74	33 34 34	MELL NUMBER	X-3	3.	3-3-	3-2	**	X-Z
Parameter	Level		?	3	}			١					1
Manipular Pers			MITTER	MINE	MODIE	MIDLE	HEDDE	MIDDLE	MINE	MINE	MINE	MIDIE	MEDILE
Chan Samulad			10/21/87	01/06/88	01/06/88	<b>36</b> /35	11/20/86	01/15/87	04/27/87	04/27/87	04/27/87	08/10/87	08/10/80
			RADIAN	PADIAH	RADIAN	•	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/23/87	01/07/88	01/06/88		12/03/86	01/22/87	05/06/87	06/06/87	05/06/87	08/17/82	08/17/87
4			38	SKC	360		S.	SK SK	3	<b>S</b>	<b>S</b>	<b>3</b>	3 1
Field Amlysis									É	Æ	<b>8</b>	¥2	35
Lab Analysis				<b>Š</b>	9			,	ş	<b>8</b> 23			
Vicasi abilanida			9	Ş	2	2	12000	1224C	1800	1600	190C	14C	170
The Carte Control	, ,		<u> </u>	ξ a	1180	8	730C	1710	250	SIC	28	8. S	110
1,1-Diriuccounter	۶ ه	. 4	3 9	9	9	<u> </u>	1400C	35	1500	1400	2057	392	300
	3 5	ع ہ	2 5	9	9	2	1.80	9	2	2	2	2	2
4 2 P. L.	3.	3 ,	9 9	9 9	9	2	390.	140	2	2	2	0.230	2
1,2 District Control	۶	, ξ	8	- A	1.590	4.5	1901	2	2	2	2	2	2
1,1,1-1f.Manokoedine	8 4	3	? ; <b>5</b>	5	Ş	2	2	2	2	2	2	2	2
Tel the meters	n v	·	3	2 360	2.7EC	4.7	9.01	8.	2	2	2	2	2
Tet rachlorosthere	) <b>4</b>	, <u>y</u>	0.27C	0.16PC	0.18PC	2	1.11	2	2	2	2	2	2

RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento All UNITS AFE ug/1

MM = Manitoring Well

FLA = First field daplicate analysis

FLB = Second field daplicate analysis

LLA = First laboratory daplicate analysis

LLB = Second laboratory daplicate analysis

NO = Nothing detected
C = Analysis confirmed in second column analysis
II. = Dilated out of the confirmation run
P or PC = Identity previously confirmed
NE = Not established



SIMMEN OF COMPANY DETECTED ANALYTES IN HONTIGEDIC WELLS FROM 1961 TO 1966, HICLELAN AFB

Main caring large   Main		SHDCI	U.S.EPA				3	IL NUMBER						
HUITLE   H	Parameter	Act ion Level	Primacy MCL		3.	3. ±		35 <del>-1</del> 56	<b>№</b> -55	M+55	MF-55	<b>14</b> -55	M-55	<b>76</b> +55
10/19/97   10/19/97   01/06/88   01/06/88   01/10/98   01/12/166   01/12/165   01/12/167	Monitoring Zone			MODE	MODE	MERCE	37000	HOOLE	MEDIE	MEDLE	MEDGE	MODLE	MEDLE	MODE
No.   No.	Date Sampled			10/19/87	10/19/87	01/06/88	01/06/88	76/ /90	11/22/86	01/05/87	04/20/87	04/20/87	04/20/87	08/13/87
10/21/87   10/22/87   01/07/88   01/07/88   01/03/86   01/08/87   04/23/87	Sampled By			RADIAN	PADIAN	RADIAN	PADIAN		RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
SMC   SMC	Date Analyzed			10/23/87	10/23/87	01/01/88	01/07/88		12/03/86	01/08/87	04/23/87	04/23/87	04/23/87	08/18/87
Fig.	qe]			SK	Sec	Sec	SAC		S	S	35	35	3	3
40C         39C         5.0C         3.6PC         ND         0.34/L         0.34/L         ND         ND         ND           22C         19C         8.7C         8.7C         2.6PC         24         14C         16C         110C         310C         290C           10C         8.7C         2.9C         2.6PC         24         14C         16C         13C         13C         15C           ND         ND         ND         ND         ND         ND         0.57L         ND         ND         ND           1.2C         1.0C         0.17C         0.16PC         ND	Field Aralysis Lab Aralysis			FDA	80	ğ	<b>80</b>				Ę	<b>2</b> 4	<b>2 3</b>	
19C   19C   2.9C   2.6FC   24   14C   110C   110C   29CC   110C   110C   110C   120C   120C	Tryl chloride	2		207	36	5.00	3.690	2	0.340	0.342	2	2	2	2
10C   8.7C   2.9C   2.6PC   24   14C   18C   15C   13C   15C     NO   NO   NO   NO   NO   NO   0.57LL   NO   NO   NO     1.2C   1.0C   0.17C   0.16PC   NO   2.9LL   2.9   0.93L   0.70L   0.79C     NO   NO   NO   NO   NO   NO   NO	.,1-Dichloroethere	9	7	22	190	9.30	8.5FC	06	2100	1600	1100	3100	290C	1300
NO   NO   NO   NO   NO   NO   NO   NO	.,1-Dichlomethans	8	<b>1</b> 2	100	<b>8</b> .70	2.90	2.6FC	77	140	180	<b>16C</b>	130	252	130
1.2C   1.0C   0.17C   0.18FC   ND   2.9fL   2.9   0.93fL   0.70fL   0.79C     0.36C   ND   ND   640   15C   41C   69C   58C   58C     ND   ND   ND   ND   ND   ND   ND	hloroform	100	9	2	2	2	2	2	2	0.570	2	2	2	2
0.56C 0.30C ND ND 640 15C 41C 69C 58C 55C  ND N	1,2-Dichlorcethane	-	•	1.20	1.00	0.170	0.16PC	2	2.900	2.9	0.930	0.70DL	0.780	2
NO   NO   NO   NO   NO   NO   NO   NO	1,1,1-Trichloroethane	200	8	0.580	0.30C	2	2	079	351	410	98 98	98	SS	710
1.7C 1.8C 1.4C 1.4PC 100 110C 70C 33C 29C 51C NO NO NO NO 26 13C 46C 47C 38C 35C SC = Redian Corporation, Secremento C = Mealysis confirmed in second column analysis SC = Redian Analytical Services, Secremento C = Mealysis confirmed in second column analysis IL = Direct type previously confirmed SC = Redian Analytical Services, Secremento C = Mealysis confirmed in second column analysis RC = Redian Analytical Services, Secremento RC = Identity previously confirmed SC = Redian Analytical Services, Secremento RC = Identity previously confirmed SC = Redian Analytical Services, Secremento RC = Redentity previously confirmed SC = Redian Analytical Services, Secremento RC = Redentity previously confirmed SC = Redian Analytical Services, Secremento RC = Redentity previously confirmed	arbon tetrachloride	ş	•	2	2	2	2	2	2	2	ē	2	2	2
NO NO NO NO NO 26 13C 46C 47C 38C 33C  RADIAN = Radian Corporation, Secremento NO = Nothing detected  SAC = Radian Analytical Services, Secremento C = Analysis confilmed in second column snalysis  II. = Dilitera our of the confilmetion and P or PC = Identity previously confirmed  NE = Nor established	richloroethers	•	~	1.70	1.80	1.4C	1.4PC	100	1100	ă	330	<b>58</b> C	SIC	370
RADIAN = Radian Corporation, Secretorico NO SAC = Radian Analytical Services, Secretoric C II. P or	let rachlomethene	4	æ	2	2	2	2	8	130	94	24,	98	380	2
	IL UNIX ARE ug/1  W = Mentcoring whil  DA = First field deplic  B = Second field deplic  DA = First importance of  E = Second importance  B = Second importance	ate aralysi cate aralys iplicate ara	s si si salysis si seljesis	. i2 i3	VIAN = Radian C = Radian	Corporation,	Secretarios ervices, Secr		D = Nothing = Analysis L = Diluced or FC = Ide E = Not esta	detected confirmed in cut of the co	n second colun suflometion ru sly canfilmed	m aralysis n i		i i



SIMMER OF COMPOLY DETECTED ANALYTES IN MORTORING LELLS FROM 1981 TO 1988, MACLELLAN APR

	200					3	T NEW						
Permeter	Act ion Level	Primary M2.	₹- \$?	¥¥-55	<b>₹</b> -55	<b>14-</b> 57	M4-57	M4-57	<b>14</b> +57	¥+57	W+57	₩+57	M4-57
Menitoring Zone			MEDIE	A BOLE	MEDIE	MODE	MODLE	MEDIE	MODE	MODLE	MODE	KODE	MEDILE
Dere Samied			10/14/87	10/14/87	01/11/88	18/	11/19/86	01/13/87	04/28/87	04/28/87	07/30/87	10/12/87	01/08/88
Sampled By			PADIAN	RADIAN	RADIAN		PADIAN	RADIAN	RADIAN	PADLAN	PADIAN	RADIAN	RADIAN
Date Analyzed			10/18/87	11/09/87	01/12/88		11/2/86	01/20/87	04/30/87	04/30/87	08/03/87	10/14/87	01/11/88
- - -			38	8	3		S	SAC	Sec	Sec	SKC	Sec	SC
Field Analysis Lab Analysis									Ę	5		;	
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	9	£
,1-Dichloroethers	•	7	24C	18.0	330	8	2.30	130	2	2	1.60	1.20	3,60
1,1-Dichloroethers	ଷ	¥	4.00	9.9	3.70	2	2	2	2	2	2	2	2
Orloroform	901	90	2	2	2	2	2	ð	2	2	£	2	2
,2-Dichloroethane	•	\$	0.950	2	1.10	2	2	2	2	2	2	2	2
1,1,1-Trichlomethere	200	900	340	17.0	10C	2	2	0.880	2	2	2	2	2
Carbon tetrachloride	'n	2	2	9	5	2	2	2	2	2	2	2	2
Trichloroethene	'n	'n	7.0C	6.9	110	6.0	2.50	14C	2	2	2	0.58C	2.30
Tet rachlomethme	4	벌	બ્ર	7.9	6.80	2	2	2	2	2	2	2	2
AL UNITS APE ug/1													
W - Monitoring Well			æ	RADIAN = Radian Cosporation, Sacramento	Corporation,	Sacramento	_	O = Nothing	detected				
Fig. field deplicate analysis	ate aralysi.	*7	o	Ħ	e Erwiremen	Cannie Entramental Services	•	deviated = 0	- Analysis confirmed in	in second column analysis	m analysis		
IB = Second field deals.	cate analys		ď	SAC = Radian	Analytical	ervices. Sac	•	ME - Not est.	abl Lebed				



SIMMEY OF COMPLY DETECTED ANALYTIS IN MUNICOLDS WELLS FROM 1981 TO 1988, MICLELLAN AFB

Parameter	POR Action Level	U.S.EPA Primary P	93-13E A	95- <del>1</del> 2	97	9 *	85-194 87-194	95-134	95 - <del>1</del>	95- <u>3</u> E	M+59	65- <b>PN</b>	SS-32
Munitoring Zone			433	833	230	230	88	200	220	<b>230</b>	200	200	2390
Date Sampled			11/21/86	01/19/87	01/19/87	m/19/87	04/30/87	08/06/80	10/13/87	01/11/88	04/02/86	11/18/86	01/12/87
Sampled By			RADIAN	RADITAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/25/86	01/22/80	01/22/87	01/22/87	05/05/87	08/10/80	10/16/87	01/12/88	04/02/86	11/21/86	01/20/87
			Sec	S	SKC	38	Sec	S	2	3	3	3	<b>S</b>
Field Avalysis				PD.	825	902							ĕ
Lab Analysis					ā	9							
Virwi chloride	2	1	1.30	2	2	2	2	2	2	2	2	2	2
1.1-Dichlomerhene	· •c	, ,	2	3.30	2.90	3.20	2	2	2	0.270	Ħ	270C	<b>3</b> 8
1.1-Dichlomethan	8	2	2.00	0.320	2	2	9	2	2	2	2	1.7L	2
Chloraform	8	100	9	9	2	2	2	2	2	2	2	0.650	2
1.2-Dichloroethane		5	9	9	2	2	2	2	2	2	2	2	2
1.1.1-Trichloroethane	200	200	0.360	2.40	2.10	2.30	2.30	2	2	0.25C	1.1	261	5.30
Carten retrachloride		<b>'</b>	9	2	2	2	2	2	2	2	2	2	2
Trichloroethere	'n	'n	9.0	9	1.30	35.	1.50	2	2	2	ส	290C	210
Tetrachlomethere	4	2	2	9	2	2	2	2	2	2	2	0.10 <b>E</b>	2
the tarties and													

ALL UNITS ARE ug/1

NA = Minitoring Well

FIA = Pirst field duplicate analysis

FIB = Second field duplicate analysis

LIA = Pirst inhoratory duplicate analysis

LIB = Second laboratory duplicate analysis

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
C = Analysis confirmed in second colum analysis
II, = Dilited out of the confirmation run
NE = Not established



SIPPARY OF COPOLLY DEDICTED ANLYTES IN HONTICRING WELLS FROM 1981 TO 1988, MCLELLAN APE

		U.S.EPA		977	9	9	ELL NAMER	93	95-1-M	9	9	9	9
Parameter	Lovel	Ä	S	5	<u> </u>	3	ì	} !	1	}			
Manitoring Zone	<u> </u>		2230	200	220	8	230	2530	2330	SHALION	SHALOW	SHALON	SHWICH
Date Sampled			01/12/87	04/21/87	04/21/87	08/10/82	08/10/87	10/09/87	01/08/88	58/ /93	98/ /82	02/06/86	10/28/86
Sampled By			RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN			USA	RADIAN
Date Analyzed			01/20/87	04/23/87	04/23/87	08/11/80	08/11/80	10/12/87	01/11/88			05/16/86	10/29/86
4			Sec	36	Sec	SAC	SK	SKC	Sec			ALAB	<b>3</b>
Field Analysis			801	<b>M</b>	<b>813</b>	Æ	Ę						
'inyl chloride	7	1	2	2	2	2	2	2	2	2	2	2	2
1-Dichloroethene	•	7	26	2/3	200	261	2	31	3.1PC	2	2	2	2
1-Dichlocoethane	20	¥	2	2	2	2	2	0.130	2	2	2	2	2
Moreform	100	90	2	2	2	2	2	2	2	2	2	2	2
2-Dichloroethere	-	S	2	2	2	2	2	2	2	2	2	2	2
1,1-Trichlocoethane	200	8	8.1C	3.30	3.30	1.00	0.900	2	0.21FC	2	2	2	2
arbon tetrachloride	ş	s	2	2	2	2	2	2	2	2	2	2	2
[richloroethere	5	'n	108C	380	203	S	110	6.3C	2.3PC	2	2.3	5.0	2
let rachiomethere	4	逆	2	2	2	2	2	2	2	2	2	2	2

All UNITS ARE up/1 M4 = Manizoring Well FDA = First field deplicate analysis FDB = Secord field deplicate analysis

RADIAN = Radian Corporation, Secremento
USAF = United States Air Force
AMAB = Ariab Analytical Lab
SAC = Radian Analytical Services, Secremento



SIMMEY OF COMPALY DETECTED MALYTES IN MORTHRING WELLS FROM 1981 TO 1988, MICLELLAN APB

	Ä	11 5 504					11. MPRER						
Parameter	Action Primary Miliane M.	Primary M.T.	95 14 14 16 16 16 16 16 16 16 16 16 16 16 16 16	9 <del>-1</del>	<b>N</b>		09- <b>19.</b>	99	19-4J	19 <del>-1</del> 4	19-19A	MH-61	M4-61
Monitoring Zone	-	-	SHALLOW	SHALON	MOTANS	MOTANS	MOTAN	SEWLOW	BALLOL	SHALOW	SHALON	MOTIMAS	SHALLOW
Date Sampled			01/13/87	04/24/87	08/13/87	10/25/87	01/22/88	01/22/88	90/ /82	59/ /60	10/ /85	03/19/86	12/01/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN				RADIAN	RADIAN
Date Analyzed			01/19/87	04/28/87	08/18/87	10/29/87	01/25/88					03/21/86	12/04/86
4			SKC	S	S	SKC	3	Ø				S	<b>3</b>
Field Amiysis Lab Analysis													
Viryl chloride	2	1	9	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethere	•	_	2	2	2	2	9	2	2	2	2	2	2
1.1-Dichloroethane	50	¥	2	2	2	2	2	2	2	2	2	2	2
Onloroform	001	8	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	-	٠,	2	2	2	2	9	2	2	2	2	2	2
1,1,1-Trichlomethere	900	200	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	s	٠,	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	5	\$	2	2	2	2	2	2	2	2	5.6	3.1	7.4
Tetrachloroethere	4	2	2	2	2	2	2	2	Q	2	2	2	2
ALL UNITS APE up/)													
MW = Manitorine Mell			œ	RADIAN = Radian Componention, Secremento	1 Comoration.	Secremento	-	ND = Nothing detected	detacted				
						1		1 11 11 11	1				

ND = Nothing detacted NE = Not established RADIAN = Radian Corporation, Secremento
GES = Generale Environmental Services
SAC = Radian Analytical Services, Secremento



SLIMMEY OF COMPONLY DETECTED ANALYTISS IN MONTORING WELLS FROM 1981 TO 1988, MACLELAN AFB

Parameter	DOFS Action Level	U.S.EPA Primacy MCL	<b>₹</b>	1 <del>9-15</del> 4	<b>3</b> 9 <b>★</b>	9 3 3 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	ELL NUMBER MAT-61	<b>1</b> 9- <b>1</b>	MH-61	N <del>1</del> 63	FF-63	<del>14-6</del> 3	₩+63
Manitoring Zone			SHULDN	SHALON	HOTIMES	MOTIVES	SHALLOW	SHULON	SPWLOW	â	2230	200	DEEP
Date Sampled			01/29/87	05/07/87	05/07/87	78/10/80	10/13/87	01/13/88	01/19/88	04/02/86	04/02/86	04/02/86	11/25/86
Sampled By			RADIAN	RADIAN	RADIAN	PADLAN	PADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			01/30/87	05/12/87	05/12/87	08/11/87	10/16/87	01/20/68	01/20/88	04/05/86	04/05/86	04/05/86	12/02/86
4			Sec	S	SKC	SKC	S	3	Sec	S	S	SK	S
Field Analysis										¥G.	<b>8</b>	F. 138	Ž
Lab Analysis			,	<b>¥</b>	<b>8</b> 2			á	<b>8</b>		<b>§</b>	5	
Viryl chloride	7	1	£	9	9	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	1	2	2	2	2	2	£	2	2	2	2	0.250
1,1-Dichloroethare	8	N.	2	2	2	2	2	Ę	Ę	2	2	2	0.15E
Chloreform	100	9	0.160	2	2	2	2	2	2	2	2	2	0.13TL
1,2-Dichloroethare	-	S	2	2	2	2	2	2	2	7.0	4.0	7.0	2
1,1,1-Trichloroethane	<b>20</b>	8	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	s	S	2	2	2	2	2	2	2	2	2	2	2
Trichlopoethere	ş	•	×	350	230	14C	5.30	33.	4.1C	3	Ж	Ж	202
Tet rachloroethere	4	<u>w</u>	2	2	2	2	2	2	2	2	2	2	2

AL UNITS ARE ug/L
M = Manitoring Well
FIA = First field deplicate analysis
FIB = Second field deplicate analysis
LIA = First laboratory deplicate analysis
LIB = Second laboratory deplicate analysis

ND = Norhing detected
C = Analysis confirmed in second column analysis
DL = Diluted out of the confirmation nu
NE = Not established

RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento



SLAMARY OF COMPOUR DETECTED ANALYTES IN MONTHQUING WELLS FROM 1981 TO 1988, MACLELAN APB

	200	U.S.EPA				•	THE MARKET						
Parameter	Action	Primary M.C.	23 14 15	<b>₩</b> +63	<b>₩</b> -63	₩ <del>-</del> 63	£9 <b>-€</b> 3	M <del>1-6</del> 3	\$ <del>1</del>	¥-65	<b>69</b>	<b>₩</b> -67	19 <del>-19</del> ₩
Muttoring Zane			2330	Deep	dego	deal	6590	GERO	GHAIR	CUALTO	TO LAND		
Date Sampled			11/25/86	01/27/87	05/11/87	08/14/87	10/22/87	B / 1/ 1/	76/ /8U	11/ /85	100 / OO	30, 701	
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADTAN	}	3	<u>3</u>	<u> </u>	03/20/80
Date Analyzed			12/02/86	02/02/87	05/13/87	08/20/87	10/29/87	01/25/88					NACLAN 02/26/06
व			Sec.	Sec	28	280	3	3					03/20/00
Field Analysis			902			1	ì	1					ž
Lab Analysis													
Viry! chloride	2	7	5	5	2	2	GN.	5	Ę	S	S	5	9
1,1-Dichlomerhane	9	•	0.24C	£	2	2	5	32.0	2	2 5	9 9	2 9	9 9
1.1-Dichlomethere	20	2	151 0	2	9	9	9 9	3	2 9	<u> </u>	⊋ !	2 !	2
Momform	٤	į	6	1	9	2 :	2 9	9 9	2 !	2	5	2	5
	3.	3 .	7	5	5	5	5	5	2	2	2	2	2
1,2-Dichloroethane	-	'n	ម	2	2	2	2	0.780	2	2	2	4.7	9
1.1.1-Trichlomethane	200	80	2	2	2	2	2	2	2	2	1.1	2	9
Carton tetrachloride	S	S	2	2	2	2	2	2	2	2	2	2	9
Trichloroethene	۰	٠,	24C	710	210C	190C	SS	269	110	11	2	2	2
<b>Fetrachloroethme</b>	4	¥	2	2	2	2	2	2	2	2	2	2	2

M = Manitoring Well FIB = Second field duplicate analysis

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
C = Analysis cardiumed in second colum analysis
IL = Diluted out of the confirmation run
NE = Not established



SIMMRY OF COMPLEY DETECTED AWLYTES IN MATTORING WELLS FROM 1981 TO 1988, MCLELLAN AFB

	SOS	U.S.EPA				3	EL NUMBER						
Parameter	Act ion Level	Primary M.L.	<i>19-1</i> <b>1</b>	₩ <del>1-6</del> 7	₩ <del>-6</del> 7	£4-€7	<i>19</i> ₩	<b>19-19</b>	<b>₩</b> -67	V4-67	98 <b>1</b>	89- <b>1</b> 11	33 14 15
Monitorine Zone			SWIDN	SHALLON	SHALON	POTMES	SHALLON	SHALON	MOTANS	SHALION	POTMES	SHATON	SHILLS
Date Samled			10/17/86	01/23/87	05/06/87	08/15/87	10/20/87	10/20/87	01/26/88	01/26/88	98/ /82	12/ /85	05/13/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN			RADIAN
Date Analyzed			10/21/86	01/29/87	05/11/87	08/19/87	10/27/87	11/24/87	01/28/88	01/28/88			05/18/87
व			Sk Sk	38	SAC	S	Sec	8	3	SAC			35
Field Aralysis Lab Aralysis									<b>4</b>	<b>5</b>	!		
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	9	2
1.1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethane	ន	¥	2	2	2	2	2	2	2	2	2	2	2
Onlocatour	100	90	2	2	2	2	2	2	2	2	2	2	2
1.2-Dichloroethane	H	٠,	2	2	2	2	2	2	2	2	2	5.3	2
1,1,1-Trichloroethane	200	007	2	9	2	2	0.300	2	2	2	9	2	2
Carbon terrachloride	'n	٠	2	2	2	2	2	2	2	2	2	2	2
Trichlomethere	'n	S	2	2	2	2	2	2	2	2	2	2	2
Tet rachloroethene	4	9	2	2	9	<b>2</b>	2	2	æ	Q	Q	2	2
ALL UNITS ARE UR/1													
MW = Manitoring Well			2	DIAN = Radio	RADIAN = Radian Corporation, Sacramento	. Sacramento		NO = Nothing	<ul> <li>Nothing detected</li> </ul>				
LDA = First laboratory da	uplicate an	siscle	8	×	Caronie Environmental Services	tal Services		C = Analysi.	s confirmed to	in second column analysis	m analysts		
(78 = Second Jahoratory denlicate analysis	den icate a	sisylen	SS	*	Radian Analytical Services, Secrament	Services, Sec.	Camerico	NE - Not est	abl 1shed				



SIPPARY OF COPCOLY DETECTED AWLYTES IN HOUTTORING WELLS FROM 1981 TO 1988, HICLELAN AFB

	90 90 90	U.S.EPA				9	LL NUMBER						1
Parameter	Act ion Level	F.	99 1	<b>8</b> 9 <b>1</b> 4	<b>99</b>	69-11	\$	69 14	\$ <del>1</del>	69- <b>19</b> .	\$ <del>1</del>	\$ <del>1</del>	R-13
Manitoring Zone			SEMILON	SHALOW	SHWIGH	MINIE	MIDTE	MIDIE	MEDINE	MIDLE	MINDLE	MIDNE	MIDLE
Date Sampled			08/01/87	10/23/87	01/25/88	/BS	11/25/86	01/28/80	05/13/87	08/01/87	10/20/87	O1 /23/88	01/29/87
Sampled By			RADIAN	RADIAN	RADIAN	ļ	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			08/10/80	10/29/87	01/27/88		12/02/86	01/30/87	78/81/50	08/06/87	10/23/87	01/25/88	01/30/87
4			SKC	SVC	S		S	S	Sec	380	5	Sec	5
Field Aralysis			,		!		ì		ì	}	}	ì	}
Lab Analysis													
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	0.100	2	2	2	2	2	2
1,1-Dichloroethans	8	¥	2	2	2	2	2	2	2	2	2	2	2
Chloroform	100	9	2	2	2	2	0.100	2	2	2	2	2	2
1,2-Dichloroethane	1	2	2	2	2	2	2	2	2	2	2	2	2
i,1,1-Trichlomethere	200	007	2	2	2	2	Ð	2	2	2	2	2	2
Carbon tetrachloride	s	2	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	s	S	2	2	2	2	0.650	2	2	2	2	2	2
Tecrachlomethere	7	2	2	9	2	2	2	<b>2</b> .	2	2	2	2	2
ALL UNITS APE UR/1													
MW - Manitoring Well			\$	DIAN = Radian	RADIAN = Radian Corporation, Sacramento	Secramento	Z	D = Nothing detected	detected				
			<b>5</b> 1	C = Radian	- Radian Analytical Services, Sacrament	ervices, Sacr	Smerito C	: = Analysis E = Not esta	nalysis confirmed in second column analysis ot established	second colum	n <del>en</del> alysis		



SIMMEY OF COMPLEX DETECTED AMELYTES IN MOUTIQUING WELLS FROM 1981 TO 1988, MAZELLAN APR

Maritocing   Action   Petimary   Maritocing   Maritocin		SORS	U.S.EPA				3	TT NIMBER						
HTDTE   HTDT		Act lon Level	Primary M.C.	<b>M</b> +70	0. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	<b>14</b> -70		¥+71	<b>∓</b>	<b>¥</b> -72	M-72	<b>14</b> -12	M#-72	<b>H</b> -72
10   10   10   10   10   10   10   10	g Zere	İ		MIDLE	MIDLE	MEDIE	MODIE	MODGLE	MIDNE	MONE	MITTE	MORTE	MITTE	MERCE
R4D1AF   R	led			05/12/87	08/14/80	10/16/87	m /07/88	79/	70,	05/08/87	CB/17/80	10/20/87	78/06/01	03/09/30
Shirt   Shir				RADIAN	RADIAN	RADIAN	RADIAN	]	3	RADTAN	BAOTAN	RAUTAN	RADIAN	RADIAN
SAC   SAC   SAC   SAC	yzed			05/118/87	08/19/87	10/19/87	01/08/88			05/13/87	CR/19/87	10/22/87	11/24/87	01/11/88
2 1 ND				SEC	SWC	S	38			3	5	S	S C	3
2 1 ND	lysis					]	}			}	}	ì	}	}
1	sis													
1	ide	2	-	2	2	2	2	2	9	410	2	2	2	2
20   KE   NO   NO   NO   NO   NO   NO   NO   N	oethere	9	,	2	2	0.270	0.25FC	2	2	5500	19000	520C	320	930PC
100   100   NO   NO   NO   NO   NO   NO   NO		ଷ	<u>12</u>	2	2	2	2	2	9	3	1500	28	19	5
1 5 NO		81	90	2	2	2	2	2	2	2	2	3.20	2	2
Column	cethane		~	2	2	2	2	2	2	380	1400	120C	88	140PC
Color   Colo	•	88	<b>50</b>	2	2	2	2	2	2	5.80	730	230	7	38,
5 5 NO 0.79C NO NO NO NO 4 NE NO NO NO NO NO NO 10 NO 10 NO NO 10 NO NO 10 NO	achloride	s	ۍ	2	2	2	2	2	2	2	2	2	2	2
bil RADIAN = Radian Corporation, Secremento CES = Caronia Brairomental Services SAC = Radian Analytical Services, Secremento	au au	'n	•	₽	0.7%	2	2	2	2	410C	12000	2600	98	870PC
PAULAN = Radian Corporation, Secremento   CES	ethere	4	¥	2	9	2	2	2	2	2	2	2	2	2
Z = Z	ocing Well			202	DIAN = Redian S = Canonia C = Radian	Corporation, Environment. Analytical S	Sacramento al Services ervices, Sacr	mento	MD = Nothing detected C = Analysis confirm P or PC = Identity pu	ND = Nothing detected C = Analysis confirmed in second column enalysis P or RC = Identity previously confirmed	second colum	n eralysis		
								-	E = Not est	abit shed				



SIMMEY OF COMPALY DETECTED AWLYTES IN MANTGRING WELLS FROM 1981 TO 1988, MAJELIAN AFB

Parameter	DGRS U.S.RPA Action Primary Level HG.	U.S.EP. Primac.	¥. ¥.	<b>8</b> 8	88 <del>1</del>	8 8	21. N. MEZZ 71. 88 71. 88	88 <del>1</del>	<b>8</b>	58- <b>±</b>	88 <del>1</del>	86 <del>1</del>	\$ <del>\$</del>
Menitoring Zone Date Sempled Sempled By Date Analyzed Lab Fleid Amalysis			SHILON 01/06/87 RADIAN 01/08/87 SAC	SHVLOW 05/04/87 RADIAN 05/06/87 SAC	SHALLOH OS/OG/87 RADIAN OS/OG/87 SAC	SHALICH 08/13/87 RADIAN 08/17/87 SAC	SBALLOH 10/24/87 RADIAN 10/29/87 SAC	SHALION 01/21/88 RADIAN 01/22/88 SAC FDA	SHALLON 01/21/88 RADIAN 01/22/88 SAC FTB	SHALICH 01/06/87 RADIAN 01/08/87 SAC	SHALICH 05/04/87 RADIAN 05/06/87 SAC	SWLICH 08/13/87 RADEAN 08/17/87 SAC	SENTION 10/21/87 RADIAN 10/28/87 SAC
Virgi chloride	2	-	9	9	2	9	2	9	9	9	2	2	2
1,1-Dichlomethere	9	1	1.10	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	ឧ	Ä	2	2	2	2	2	2	2	2	2	2	2
Chloreform	90	8	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichlocoethere	-	٠	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethers	80	0Q;	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	S	'n	2	2	2	2	2	2	2	2	2	2	2
Trichlomethere	ۍ	۰	2	2	2	2	2	2	2	2	2	2	2
Tetrachloroethere	4	7	2	2	2	2	2	2	<u>ê</u>	2	2	2	2
						2							

All INITS AGE ug/1

M4 = Menitoring hell

M5 = First field deplicate analysis

M5 = Second field deplicate analysis

M5 = First indonatory deplicate analysis

M6 = Second laboratory deplicate analysis

ND = Nothing detacted
C = Analysis confirmed in second column analysis
NE = Not established RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Secramento



SLAWRY OF COMPONEY DETECTED ANALYTES IN HOUTINGING HELLS FROM 1981 TO 1988, HAZELAN API

Paca <b>re</b> t es	Action Level	U.S.EPA Primary MCL	A 144-89	87 <b>- 1</b> 3	<b>8</b> 7-18	3 8 3	ELL NUMBER ML-90	98 111	¥-91	15-12	<b>16</b> − <b>3</b>	¥-3	£ 24
Menitoring Zone Date Sampled Sampled By Date Analyzed Lab Field Analysis Lab Analysis			SEWILCH 01/11/88 RADZAN 01/12/88 SAC	SHALCH 01/20/87 RADIAN 01/23/87 SAC	SENTION 05/04/87 RADIAN 05/06/87 SAC	SHILON 06/13/87 RADIAN 08/17/87	SHALIGH 10/12/87 RADIAN 10/14/87 SAC	SHULCH 01/20/88 RNDLAN 01/21/88 SAC	SHLLG4 01/20/87 RADLAN 01/26/87 SAC FDA	SHULCH 01/20/87 RADLAN 01/26/87 SAC FUB	SHVICH C4/21/87 R401 W C4/22/87 SAC	SWLCH 07/28/87 RADIAN 07/29/87 SAC	SHULOH 10/12/87 RADIAN 10/13/87 SAC
Viryl chloride 11.1-Dichloroether 11.1-Dichloroether 11.2-Dichloroether 11.2-Dichloroether 11.2-Dichloroether 2.2-Dichloroether 2.2-Dichloroether 2.2-Dichloroether 17.1-Dichloroether 17.1-Dichloroether 17.1-Dichloroether	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	7 7 100 5 200 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	5 - 5 5 5 5 5 5 5 2	2 2 2 2 2 2 2 2	2222222	5:155555	6 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	8 6 6 8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	8 <del>3</del> 8 8 8 8 8 8 8	525555 2	<b>8</b> 35555	5 ° 5 5 5 5 5	5.65555
et rachloroethene	4	2	2	2	2	2 2	2 2	2 2	2	2	₹ <u>8</u>	¥ 2	6 Z

AL UNIN ARE ug/1 M = Manitoring hell FDA = First field deplicate analysis FDB = Second field deplicate analysis

RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Secremento

ND = Nothing detected C = Analysis confirmed in second column analysis NE = Not established



SIMMRY OF COMPLY DETECTED ANALYTISS IN HONTINGING MELLS FROM 1981 TO 1988, MICLELAN APR

	200	U.S.EPA				3	11. NIMBER						
Parameter	Action Primary Ma- Level MCL	Primary MCL	₩-3	<b>16-191</b>	<b>26</b>	¥+35	26-4 <u>8</u>	<b>4</b> -36	<b>14</b>	<b>W</b> +92	2 <del>7.</del>	<b>M</b> -100	₩-100
Menitoring Zone			SPWICH	SHALOW	SHALLON	HOTIMAS	MOTIVES	SHALON	SPWICH	SHALLON	SEALON	MIDLE	MEDIALE
Date Sampled			10/12/87	01/21/88	01/20/87	04/21/87	07/28/87	10/26/87	10/26/87	01/21/88	01/21/86	12/21/86	12/21/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	NATCAN	RADIAN	PADIAN
Date Analyzed			10/13/87	01/22/88	01/26/87	04/22/87	07/29/87	10/29/87	10/29/87	01/22/88	01/22/88	12/26/85	12/26/85
4			SK	SAC	SAC	SKC	SKC	Sec	3	Si	36	3	S
Field Aralysis			F138					ACE	811	Æ	<b>904</b>	Ð	Ą
Lab Analysis												ž	<b>5</b>
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	1	3.30	1.30	2	2	2	9	2	2	2	2	2
1,1-Dichloroethane	8	¥	9	2	2	2	2	2	2	2	2	2	2
Chlorefoan	001	100	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	-	2	2	2	2	2	2	2	2	2	2	2	2
i.1,1-Trichlomethane	200	90	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	\$	•	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	'n	۰	<b>9</b>	9.60	6.20	2.80	9.4C	3.80	3.73	4.4PC	3.7EC	2	2
Tet rachloroethene	4	Ä	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
Ma = Menitoring well			å	MOTAN = Radian Comocation Servaner	Compration	Servante	-	C. a Machine detected	determent				

FDs = First field deplicate analysis

FDs = Second field deplicate analysis

LDs = First laboratory deplicate analysis

LDs = Second laboratory deplicate analysis

SAC = Radian Analytical Services, Sacramento

C = Aralysis confirmed in second column snalysis
P or FC = Identity pneviously confirmed
NE = Not established



SIMMRY OF COMMAN DETECTED ANALYTES IN MONTIQUIC WELLS FROM 1981 TO 1986, NICLEULAN APP.

	SEC	U.S.EPA				7	EL NASS	·					
Parameter	Act ion Level		M4-100	M4-100	M4-100	M+100	MH-100	M4-100	MF-100	<b>M</b> +100	M-100	<b>₩</b> -100	M4-101
Munitoring Zone			MODE	MEDIE	MEDIE	MEDIE	MODE	MODE	MEDILE	MEDLE	MEDILE	MODE	SHILD
Date Sampled			12/21/85	02/27/86	09/16/86	01/09/87	01/09/87	04/11/87	08/01/87	08/03/87	10/19/87	01/22/88	11/18/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIZAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			12/26/85	03/11/86	09/23/86	01/15/87	01/15/87	04/27/80	08/13/87	08/11/87	10/27/87	01/26/88	11/24/85
वहा			S	S	3	2	3	Si	3	36	SK	Sec	3
Field Analysis			90						Æ	902			
Lab Aralysis						4	<b>8</b> 173						Ą
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
,1-Dichloroethere	9	1	2	2	2	2	2	2	2	2	2	2	2
.1-Dichloroethane	8	Ή	2	2	2	2	2	2	2	2	2	2	2
hloroform	921	901	2	2	2	2	2	2	2	2	2	2	2
,2-Dichloroethane	-	\$	9	2	2	2	2	£	2	2	2	2	9
,1,1-Trichlorcethane	200	88	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	2	٠	2	2	2	2	2	2	2	2	2	2	2
Crichloroethere	5	2	2	2	2	2	2	2	2	2	2	2	2
(etrachlorcethene	4	<u>y</u>	2	2	2	2	2	2	2	2	2	2	2

ALI INTE ARE 18/1

W = Minitoring Mell
FINe = First field diplicate analysis
FIR = Second field diplicate analysis
LIM = First Laboratory diplicate analysis
LIM = Second laboratory diplicate analysis

ND = Nothing detacted NE = Not established

RADIAN \* Radian Corporation, Sacramento SAC \* Radian Analytical Services, Sacramento



SHAWRY OF COMPLEX DETECTED AMEYTES IN MONTHRING HELLS FROM 1981 TO 1988, MAZELLAN AFB

S.O. SECOLO	30 S	U.S.EPA					EL NIMBER						
araneter	Action	Action Primary Level MI	MF-101	<b>M</b> 4-101	<b>M</b> +101	<b>H</b> +101	M4-101	MF-101	<b>M4-</b> 101	M-101	M-101	<b>M</b> -101	<b>M</b> -101
Monitoring Zone			SHALLOW	SHALLOW	MIN	SHALDN	SEMILON	SWIDN	SHILOW	SHALIGH	SEWILCH	SHALION	SWID
Date Sampled			11/18/85	03/05/86	09/16/86	98/19/60	01/09/87	04/11/87	08/05/87	08/05/87	08/05/87	10/19/87	01/22/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/24/85	03/10/86	09/23/86	09/23/86	01/15/87	04/21/87	08/07/87	08/07/87	08/01/87	10/21/87	01/26/88
41			SAC	Sec	S	Sec	S	S	S	S	S	S	S
Field Amlysis									¥G.	AG.	906		
Lab Aralysis			<b>8</b> 11		<b>4</b>	<b>9</b>			Š	<b>9</b>			
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
,1-Dichloroethene	ø	7	2	2	2	2	2	2	2	2	2	2	2
.,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	S	2	2	2
Moroform	001	901	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	1	\$	2	2	2	2	2	2	2	2	2	2	2
, 1, 1-Trichloroethane	902	900	2	2	2	2	2	2	2	2	2	2	2
arbon tetrachloride	s	2	2	2	2	2	2	2	2	2	2	2	2
Irichioroethene	s	Ś	2	2	2	2	2	2	2	2	₽	2	2
letrachlomethere	4	2	2	2	2	2	2	2	2	2	2	2	2

ALL UNITS ARE ug/1
NM = Manitoring Well
FDA = First field deplicate analysis
FDB = Second field deplicate analysis
LDA = First laboratory deplicate analysis
LDB = Second laboratory deplicate analysis

ND = Nothing detected NE = Not established RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Secremento



SIMMEY OF COMPALY DETECTED AMEYTES IN MINITIONING WELLS FROM 1981 TO 1988, MICLELAN APR

	SIDO	U.S.EPA				_	EL NAMER						
Parameter	Act ion Level	Primary M.D.	<b>14</b> -102	<b>M</b> −102	<b>₩</b> -102	<b>4</b> +102	<b>№</b> -102	<b>M</b> +102	<b>M</b> -102	<b>M</b> -102	<b>M</b> +102	<b>16</b> -102	<b>14</b> -105
Monitoring Zone			SHALOW	SHALLOW	SHALLOW	SHUDW	SHWIDN	SHULON	SHULOH	SHALOW	SEMILON	HOTIMAS	SHILON
Date Sampled			11/04/85	03/11/86	09/18/86	01/09/87	04/22/87	08/01/80	08/01/87	08/01/87	10/19/87	10/19/87	10/19/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/11/85	03/17/86	09/23/86	01/15/87	04/27/87	08/11/87	08/11/87	08/11/80	10/21/87	10/21/87	11/03/87
4			SMC	Sec	SS	S	SK	35	36	35	S	Se	8
Field Analysis								Æ	Æ	FD8			
Lab Aralysis								<b>1</b>	<b>8</b>		<b>8</b>	ğ	ş
Viryl chloride	2	-	2	2	2	2	2	2	2	2	2	2	2
.,1-Dichlomethere	9	,	2	2	2	2	2	2	2	2	2	2	2
1-Dichloroethane	8	빌	2	2	2	2	2	2	2	2	2	2	2
Chloroform	901	100	2	2	2	2	2	2	2	2	2	2	2
.2-Dichloroethere	7	\$	2	2	2	2	2	2	2	2	2	2	2
,1,1-Trichloroethane	700	ଷ୍ଟ	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	ş	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	'n	5	2	2	2	2	2	2	2	2	2	2	2
Fet rach loroethere	4	Ä	2	2	2	2	2	2	2	2	2	2	2

ALI UNITS ARE ug/1
194 = Manitoring Well
195 = First field deplicate analysis
1978 = Second field deplicate analysis
1978 = Second field deplicate analysis
1978 = Second laboratory deplicate analysis
1978 = Second laboratory deplicate analysis

RADIAN = Radian Corporation, Secremento
CES = Caronie Environmental Services
SAC = Radian Analytical Services, Sacramento

ND = Nothing detacted NE = Not established



SUMMEY OF COMPONY DETECTED ANALYTES IN MONTHORING WELLS FROM 1961 TO 1988, MICLELAN APR

, , , , , , , , , , , , , , , , , , ,	Action	U.S.EPA Primary	<b>M</b> +102	M-103	M4-103	M-103	ELL NIPSER PG-103	M4-103	M+103	<b>K</b> 4-103	M4-103	₩-103	M+103
		2											
Meditoring Zone			SHALLON	HEER	MEDIE	MIDLE	X COOK	MEDIE.	MODE	MIDUE	MEDILE	MEDE	MODE
Date Sampled			01/20/88	12/20/85	12/20/85	12/20/85	03/11/86	09/18/86	01/09/87	04/22/87	04/22/87	08/04/87	10/19/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADILAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			01/21/88	12/23/85	12/23/85	12/23/85	03/17/86	09/23/86	01/15/87	04/27/87	04/27/87	08/07/80	10/21/87
9			S	S	Se	35	Se	Sk	Sec	S	Sec	Sk	3
Field Aralysis				ě	F1.0	903			ļ		i	}	ì
Lab Aralysis					Ě	<b>8</b>				ğ	95		
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
,1-Dichloroethane	8	<u>19</u>	2	2	2	2	2	2	2	2	2	2	2
Moreform	100	901	2	2	2	2	2	2	2	2	2	2	2
,2-Dichloroethane	1	5	2	9	2	2	2	2	2	2	2	2	2
,1,1-Trichlomethane	200	300	£	2	£	2	2	2	2	2	2	2	2
arbon tetrachloride	'n	ۍ	2	2	2	2	2	2	2	2	2	2	2
[richloroethere	'n	٠,	2	2	2	2	2	2	2	2	2	2	2
let rachloroethene	4	Ä	2	2	2	2	2	2	2	2	2	2	£

ALLUMYS ANE ug/1

W = Menicoring Well

FDA = First field diplicate analysis

FDB = Second field diplicate analysis

FDB = Second field diplicate analysis

FDB = Second laboratory diplicate analysis

FDB = Second laboratory diplicate analysis

ND = Norbing detected NE = Not established

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento



SLAWRY OF COMPLAY DETECTED AWLYTES IN MUNTICATAC WELLS FROM 1981 TO 1988, HICLELLAN API

	988	U.S.EPA				,	TI. NIMBER						
Parameter	Action Level	Primary MCL	M-103	M4-104	<b>M</b> +104	M-106	M-104	MF-104	M+104	N4-104	<b>74</b> -10%	<b>M</b> +104	M-104
Menitoring Zone			MODE	230	230	â	2230	833	1639	1959	6390	664	662
Date Sampled			01/20/88	12/15/85	12/15/85	03/26/86	10/02/86	01/28/87	05/11/87	05/11/87	03/31/87	03/18/20	10/21/87
Sampled By			PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADTAN
Date Analyzed			01/21/88	12/21/85	12/21/85	04/01/86	10/06/86	01/29/87	05/13/87	05/13/87	08/07/87	08/04/87	10/22/87
qe <u>r</u>			SK	Sec	SAC	Sec	Sec	SAC	SVC	Sec	5	5	3
Field Aralysis								1	l I	1	}	ì	}
Lab Aralysis				ĄŢ	<b>8</b>				ğ	907	Ą	<b>5</b>	
Viryl chloride	2		2	2	2	2	2	2	2	9	5	Ş	9
1,1-Dichloroethere	9	,	2	2	2	2	2	2	2	2	9	9	9 5
1,1-Dichloroethane	8	끷	2	2	2	2	2	2	2	2	2	2	2
Orloratorm	001	90	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	7	Ş	2	2	2	2	2	2	2	2	2	2	9
1,1,1-Trichlomethere	83	200	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	2	2	2	2	2	2	2	2	2	2	2	2	9
Trichlomethere	ş	5	2	2	2	2	2	2	2	2	2	2	9
Tetrachloroethere	4	<u>w</u>	2	2	2	2	2	2	2	2	2	2	2
													!

AL UUIS ARE ug/l He = Mrnitoring Hell LDA = First laboratory deplicate avalysis LIB = Second laboratory deplicate avalysis

RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Secremento



SIMMEY OF COMMONEY DETECTED ANALYTES IN MONTORING WELLS FROM 1981 TO 1988, MAZJELLAN AFB

S.U. SHOO	500	U.S.EPA				9	II. NIMBER						
Parameter	Action Print Level MC	g	M-104	M4-105	M+105	<b>₹</b> -105	<b>№</b> -105	<b>M</b> +105	M4-105	<b>M</b> +105	<b>₩</b> -105	M4-105	M#-105
Mandtoring Zane			E E	8 <u>1</u> 2	£	£1	230	220	230	đạ	23 20	22 22 21	68 20
Date Sampled			01/21/88	12/21/85	03/27/86	10/08/86	10/08/86	01/07/87	04/22/87	08/11/87	10/23/87	01/22/88	01/22/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			01/22/88	12/26/85	04/03/86	10/10/86	10/10/86	01/09/87	04/27/87	08/11/87	10/29/87	01/26/88	01/26/88
qei			Sec	S	3	S	3	S	SKC	Se	3	S	3
Fleld Aralysis						Ą	90					Æ	<b>8</b> 2
Lab Analysis													
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
,1-Dichloxoethene	9	7	2	2	2	2	2	₽	2	2	2	2	2
.,1-Dichloroethane	8	Ä	2	2	2	2	2	2	2	2	2	2	2
Chloroform	100	100	2	2	2	2	2	2	2	2	2	2	2
,2-Dichloroethane	н	2	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	200	2	2	2	2	2	2	2	2	0.310	2	2
arbon tetrachloride	'n	\$	2	2	2	2	2	2	2	2	2	2	2
<b>Crichloroethere</b>	'n	s	2	2	2	2	2	2	2	2	2	2	2
let rach locoethere	4	¥	2	2	2	2	9	2	2	2	2	2	2
AL UNITS ARE ug/1													
Ma * Monitorine Mail			2	RADIAN = Radian Compration. Secremento	Comparation.	Sacramento	_	ND = Nothing detected	detected				

M = Maitoring Well FIA = First field deplicate analysis FIB = Second field deplicate analysis

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
C = Analysis confirmed in second colum analysis
NE = Not established



SUPPRIX OF COMPLEX DETECTED ANALYTES IN HONTICRING NELLS FROM 1981 TO 1988, MCCLELLAN AFB

	DOM: Action	U.S.EPA	M-106	<b>1</b>	<b>1</b>	M-106	ELL NUMBER	<b>M</b>	<b>K</b>	<b>K</b> L:108	<b>1</b>	M44-107	<b>M</b> .107
Parameter	[ese]	덮					1		3	3		27	
Menitoring Zone			SWION	SHALOW	SHALON	SWICH	MOTIMAS	SWLOW	SHATON	SHALLON	SPALICIA	SPALICE	POTMES
Date Sampled			11/21/85	03/13/86	09/18/86	01/05/87	01/05/87	04/21/87	07/28/87	10/09/87	01/25/88	11/07/85	04/01/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/24/85	03/19/86	09/23/86	01/06/87	01/06/87	04/22/87	07/29/87	10/12/87	01/27/88	11/12/85	04/05/86
de.]			SkC	S	Sec	35	SK	3	SKC	3	S	S	S
Field Amlysis												!	
Lab Analysis						ğ	<b>9</b> 51						
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
.,1-Dichloroethere	•	7	2	2	2	2	2	2	2	2	2	2	2
,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	2	2	2	2
Phloroform	100	900	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichlorcethane	-	s	2	2	2	2	2	2	2	£	2	2	2
,1,1-Trichloroethane	200	<b>0</b>	2	2	2	2	2	2	2	2	2	2	2
arbon tetrachloride	'n	S	2	2	2	2	2	2	<del>2</del>	2	2	2	9
Trichloroethere	•	۰	2	2	2	2	2	2	2	2	2	2	2
Tet rachloroethers	4	2	2	2	2	2	2	2	2	2	2	5	Ð

AIL UNITS ARE ug/1

Ms = Menitoring Well

IDs = First laboratory deplicate analysis

IDs = Securd laboratory deplicate analysis



SIMMER OF CHACKLY DETECTED ANALYTES IN HONTIGRING WELLS FROM 1981 TO 1988, MACETLAN AFB

	900	U.S.EPA					11. NIMBER						
Pacameter	Act ion Level	Primary AZ	MH-107	M4-107	<b>№</b> -107	M+107	M-107	M-107	M4-108	<b>K</b> F-108	<b>14</b> -108	<b>15</b> -108	₩-108
M. Janet J. P. 1			CUALICU	CHAILOL	GWITCH CO.	GPAT TOL	SHALLOW	SWICE.	MIDLE	MODIE	MODE	MUDELE	MEDICE
Part Services			79/19/96	01/07/87	04/23/87	07/30/87	10/12/87	01/14/88	12/27/85	04/01/86	09/13/86	01/01/87	04/22/87
Service Semples			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Dare Analyzed			09/24/86	01/09/87	04/24/87	08/03/87	10/13/87	01/15/88	01/02/86	04/05/86	09/24/86	01/09/87	04/24/87
qe'l			S	SAC	SK	<b>3</b> 5	SK	Sec	SK	S	S.	S.	SK
Field Avalysis Lab Avalysis										1			
Viral chloride	,	-	Ę	Ş	2	2	2	2	2	2	2	2	2
1 1 Dichlomorphuse	1 4	. ~	2	9	9	9	2	2	2	2	2	2	2
1 1-Dich Consthere	۶ د	<u> 14</u>	? 5	9	9	9	2	2	2	2	2	2	2
A. L. Durate Contract	3 5	2	2 5	9	9	9	2	2	2	2	2	2	2
1 2-Dichlomerhane	} _	2	2	9	9	2	2	2	9	2	2	2	2
1.1.1-Trichlomethare	200	000	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	5	s	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	'n	5	2	2	9	2	2	2	2	2	2	2	2
Tetrachlomethere	4	2	2	2	2	2	2	2	2	2	2	2	2
ALL (MITS ARE 18/)													
MW = Manitoring Well			až V	RADIAN = Radian Corporation, Secremento CAC = Bedian Analytical Secretors, Secremento	Corporation	s, Sacramento Services, Ser	ramento	ND = Nothing detected NF = Not established	detected				
			1										



SLAMMED OF COMPONLY DETECTED ANALYTES IN MONTORING WELLS FROM 1961 TO 1988, MACLELLAN APR

	20 ES	U.S.EPA	_			띨	II. NUMBER						
Parameter	Action Level	Primacy MCL	M4-108	MF-108	₩+108	₩+109	M4-109	<b>M</b> -109	M+109	M+109	₩-109	M-110	<b>№</b> +110
Manttoring Zane			MEDGLE	MEDLE	MEDIE	2230	2230	degal	0652	0659	<b>d</b>	SHALON	SHALON
Date Sampled			07/30/87	10/12/87	01/14/88	11/06/86	01/06/87	04/22/87	07/30/87	10/16/87	01/14/88	11/06/85	03/31/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			08/03/87	10/13/87	01/15/88	11/11/86	01/08/87	04/24/87	08/03/87	10/20/87	01/15/88	11/11/85	04/03/86
lab Field Aralysis Lab Aralysis			Si	S	35	Si	Si	<b>3</b>	<b>3</b> 8	<b>3</b>	<b>S</b>	<b>S</b>	<b>3</b>
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	5	2	2	9	2	5	2	2
1,1-Dichloroethare	8	¥	2	S	2	2	2	2	2	2	2	2	2
Chloreform	100	100	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	1	S	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	8	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	S	٠,	2	2	2	2	2	2	Ð	2	2	2	2
Trichloroethene	5	S	2	2	2	2	2	2	2	2	2	2	2
Tet rachloroethene	4	¥	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
MV = Monitoring Well			<b>2</b> 5	VOIAN = Radian VC = Radian	Corporation,	RADIAN = Radian Comporation, Sacramento SAC = Radian Analytical Services, Sacramento	٥	ND = Nothing detected NE = Not established	detacted blished				

## RADIAN

SIMMEY OF COMPONLY DETECTED ANILYTISS IN MENTIORING WELLS FROM 1981 TO 1988, MACELLAN APP

	Action .	U.S. EPA Primary	M+110	<b>%</b> -110	<b>M</b> +110	¥-110	ELL NUMBER M4-110	<b>№</b> -110	M+110	<b>N4</b> -110	M-111	M4-111	M+111
נאדיפונר הו	Tener	į.											
Menitoring Zone			SHALLON	SHALON	SHWICH	SHALLON	SHALON	MOZMES	SHWIGH	SHALLOW	SHALON	SEWLOW	POTMES
Date Sampled			09/19/86	01/05/87	04/23/87	07/29/87	10/21/87	10/21/87	10/21/87	01/18/88	11/06/85	04/03/86	04/03/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			09/24/86	01/06/87	04/24/87	07/30/87	10/23/87	10/22/87	11/09/87	01/19/88	11/11/85	04/08/86	98/80/70
<u> </u>			S	Sec	S	25	Sec	Ø	8	SKC	SKC	35	S
Field Analysis												AG.	Æ
Lab Analysis												ğ	9
Viryl chloride	2	1	2	2	2	2	2	2	5	2	2	2	2
,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	2	2	2
,1-Dichlorcethane	8	2	2	2	2	2	2	2	2	2	2	0.3	0.3
Thoroform	100	001	2	2	2	2	2	2	2	2	2	2	2
,2-Dichloroethane	7	٠,	2	2	2	2	2	£	2	2	2	2	2
,1,1-Trichloroethane	8	30	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	2	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	'n	5	2	2	2	2	2	2	2	2	2	0.3	0.2
let rachloroethare	4	¥	2	2	2	Ş	2	2	2	2	2	2	2

RADIAN = Radian Corporation, Secramento
GES = Carrule Environmental Services
SMC = Radian Aralytical Services, Secramento Washitoning Well
 First field deplicate analysis
 IDA = First laboratory deplicate analysis
 ILB = Second laboratory deplicate analysis

ND = Nothing detected NE = Not established



SIMMEY OF COMONLY DETECTED AMLYTES IN HONTREING WELLS FROM 1981 TO 1988, MALIELAN APB

	DORS	U.S.EPA	_			3	IL NUMBER						
Parameter	Act ion Level	n Primary Ma M.C.	<b>₩</b> -111	MF-111	<b>X</b> F111	M+111	<b>H</b> +111	M-111	<b>#</b> -111	M-111	₩-112	MH-112	N4-112
Manitoring Zone			SPALIGN	SPATON	NOT MES	SHATOL	SWIN.	Stat 10u	GENT	SHATTOU	UESTO	952	95
Para Carel			70, 00, 10									1	
contained and			98/69/50	65/27/89	01/09/87	04/23/87	07/29/87	10/19/87	01/15/88	01/15/88	12/20/85	04/02/86	09/22/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			04/08/86	09/24/86	01/16/87	04/24/87	03/30/87	10/27/87	01/18/88		12/26/85	98/90/10	09/24/86
4			Sec	SAC	3	S	3	35	3	8	Sec	Sk	3
Field Aralysis Lab Aralysis			FD8									}	1 5
									1				
Viryl chloride	2		2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	0.7	2	9	2
1.1-Dichloroethane	8	2	0.3	97.70	2	2	2	0.280	0.720	2	9	9	9
Orloroform	901	901	2	9	2	2	2	2	2	2	2	9	2
1.2-Dichloroethane	<b>~</b> 1	٠	2	2	2	2	2	2	0.120	2	2	9	2
1,1,1-Trichloroethane	200	8	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	٠,	ş	2	2	2	2	2	5	2	2	2	2	2
Trichloroethere	•	S	0.2	0.30	2	1.10	2	0.390	0.830	6.0	2	2	2
Tetrachloroethere	4	2	2	2	2	2	2	2	2	2	2	2	2
AL UNITS ARE ug/1													
M - Menitoring Well			æ	DIAN = Radian	Comoration.	Secremento		D = Nothing	detected				
FIB = Second field deplicate analysis	cate analys	2	ď	OS = Canonie Environmental Services	e Environment	al Services		* Analysis	Analysis confirmed in second column analysis	second colum	n analysts		
IDA = First Laboratory dralicate analysis	unlicate an	alveis	J	200	Amplaction	Sand Sand			7				



SIMMRY OF COMPANY DETECTED ANALYTES IN MAYTREING WELS FROM 1981 TO 1988, MADELLAN AFB

	DOSE	U.S.EPA				3	ST. NIMEER						
Parameter	Action Level	ion Primary Ma-	, N4-112	<b>N</b> +112	M+112	<b>14</b> -112	M+112	M-112	M-112	M-112	M+113	M-113	M4-113
Menitoring Zone			4330	2330	230	223	220	â	22	83	MERE	MEE	MODE
Date Sampled			09/22/86	01/09/87	04/24/87	07/29/87	07/29/87	10/19/87	10/19/87	01/15/86	11/06/86	01/09/87	04/24/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAK	RADIAN	RADIAN	RADITAN	RADIAN
Date Analyzed			09/24/86	01/16/87	04/27/87	07/30/87	07/30/87	10/21/87	11/03/87	01/18/88	11/11/86	01/16/87	04/27/87
3			SAC	SMC	SAC	28	Sec	Sec	8	3	SE	<b>S</b>	S
Field Analysis													
Lab Amalysis			<b>5</b>			<b>₽</b>	9						
Viryl chloride	2	-	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	۵	,	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	0.150	2	2	9
Chloreform	001	93	2	2	2	2	2	2	9	2	2	2	2
1,2-Dichloroethane		٠	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethere	700	900	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	s	'n	2	2	2	2	2	2	2	2	2	2	2
Trichlomethene	'n	٠	2	2	2	2	2	5	S	ş	2	9	2
Tetrachloroethere	4	Ä	9	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
MV = Manitoring Well	;	•	æ (	RADIAN - Radian Corporation, Secrateric	Corporation,	Secremento		NO - Nothing	- Nothing detected	1	-		
LLM = First laboratory d	uplicate a	eisyle	<b>5</b> 7 (	S Caron	le trylicamen	tal Services	. •	- Analysi	s continued to	n second colu	m analysis		
It a second laboratory denlicate analysis	de la la carte a	The Vels	ð	C = Radian	Technology Control	Secretary Secretary	Camera	1 20 657	ablished.				



SIMMEY OF COMPLEX DEDICTED AMEXIES IN MONTHRING WELLS FROM 1981 TO 1988, HAZELLAN APB

	SHOO					3	TT. NIMBER						
Parameter	Act lon Level	Primacy M.L.	<b>M</b> +113	<b>1113</b>	M-113	M+114	Mr-114	MP-134	<b>M</b> -114	<b>M</b> +124	M-114	M-114	M4-134
Monitoring Zone			MEDGE	MEDIE	MEDIE	SEWILOW	SWICE	SHALLON	SHALION	SEALON	SHWIGH	SWICE	101 MB
Date Sampled			07/29/87	10/19/87	01/15/88	11/11/85	02/28/86	10/02/86	01/13/87	04/21/87	08/12/87	10/15/87	01/07/88
Sampled By			RADIAN	RADITAN	RADIAN	RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			07/30/87	10/21/87	01/18/88	11/15/85	03/11/86	10/06/86	01/19/87	04/23/87	08/18/87	10/19/87	01/08/88
Lab Field Amalysis Lab Amalysis			<b>3</b> 5	<b>S</b>	3	<b>S</b>	S	3	<b>9</b>	25	38	<b>3</b>	og S
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	1	2	2	2	2	2	2	2	2	2	Đ	2
1,1-Dichloroethane	8	¥	9	2	2	2	2	2	2	2	2	2	2
Chloreform	100	100	2	2	2	2	2	0.10	2	2	2	2	2
1,2-Dichloroethane	-	\$	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	900	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	S	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	\$	5	2	2	S	2	2	0.23	2	2	2	2	2
Tetrachloroethene	4	M	2	2	2	2	2	2	2	2	2	2	2
AL UNITS AME ug/l MA = Minitoring Well			20	NOLAN = Radian Comporation, Secrements	Corporation,	Secremento	Z	D = Nothing detector	detected				
			7		A MILY LIES O	ELVILLES, SELL							



SHARK OF COMOLY DETACTED ANALYTIS IN NOVITORING WELLS FROM 1981 TO 1988, HAZELLAN AFB

	DOES	U.S.EPA			;	3	ELL NUMBER	;	;	;	:	,	;
Parameter	[engl	Ž,					1			97.4			
Manitoring Zone			SPALLON	MERCE	MODE	MODE	MODIE	MIDLE	MOLE	MODLE	METALE	MEDIE	MEDICE
Date Sampled			01/07/88	12/19/85	03/06/86	10/09/86	01/19/87	04/20/87	07/27/87	07/27/87	10/08/87	01/07/88	01/07/88
Sampled By			RADIAN	RADIZAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed				12/23/85	03/17/86	10/13/86	01/22/87	04/23/87	07/28/87	07/28/87	10/09/87	01/08/88	
4			8	Sec	Sec	SKC	35	S	S	Sec	Sec	S	S
Field Aralysis													
Lab Aralysis									Ą	803			
Viry! chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	2	2	2	2
Orlocatorn	100	9	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane		•	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethane	200	900	9	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	s	s	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	•	ç	2	2	9	2	2	2	2	2	2	2	2
Tecrachloroethene	4	¥	2	2	2	2	5	2	2	2	2	2	2

AL UNIN AG ug/1

M = Menteering Well

IIA = First Laboratory deplicate analysis

IIB = Second Laboratory deplicate analysis

RADIAN = Radian Corporation, Secremento CES = Centrale Environmental Services SAC = Radian Analytical Services, Secremento

ND = Nothing detected NE = Not established



SIMMEY OF COMPONEY DETECTED ANALYTES IN MONTHQUIC HELLS FROM 1961 TO 1988, MAZELLAN AFB

Parameter	DORS Action Level	U.S.EPA Primary MCL	N-116	M+116	<b>14</b> -116	M-116	511 NUMBER 144-116	M-116	M+116	M-116	M-116	<b>H</b> 4-116	N#-116
Monitoring Zone Date Sampled			SHM1.04 11/11/85	SHALOH 11/11/85	SPALION 11/11/65	SW1104 02/28/86	SHALLON 02/28/86	SEW10H 89/92/80	SHIJOH 01/14/87	SHALIGH 04/27/87	SEMILON 08/03/87	SHALON 10/09/67	SHALOH 01/13/88
Carpent by Care Aralyzed Lab Field Aralysis Lab Aralysis			11/15/85 SAC FDA	11/15/85 SAC FTB	11/15/85 SAC FTB UB	03/11/86 SAC IDA	03/11/86 Suc LDB	09/29/86 Sec	01/19/87 SAC	04/30/87 SAC	08/06/87 SAC	10/12/87 SAC	01/14/88 SAC
Viryl chloride 1,1-Dichloroethere	6 2	1	22	22	22	22	22	22	22	22	22	22	22
1,1-Dichloroethane Chloroform	88	¥ 8	2 <del>2</del>	22	22	<b>8</b> 0.3	0.2 <b>N</b>	9. Q	0.39C	22	1.1C	0.30 M	0.29PC ND
1,2-Dichloroethere 1,1,1-Trichloroethere	7 00	200 200	22	2 2	22	2 2	2 2	2 2	22	2 2	<del>2</del> 2	22	2 2
Carbon tetrachloride Trichloroethens Tetrachloroethens		ีก ๆ 🕏	222	222	222	<b>2</b> € 8 € 0.2	<b>5 5 0</b> 0	<b>8 8</b> 0.0	222	0.47C	0.25C	222	ND ND 0.12PC

RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento

ALL UMINS ARE ug/1
M4 = Munitoring Well
FDA = First field deplicate analysis
FDB = Second field deplicate analysis
LDA = First laboratory deplicate analysis
LIM = Second laboratory deplicate analysis

ND = Nothing detected C = Analysis confirmed in second column analysis P or FC = Identity previously confirmed NE = Not established



SIMMEY OF COMPLEX DETECTED ANALYTES IN HONTONING WELLS FROM 1981 TO 1988, MICHELIAN APR

	SHOO	U.S		;		3	EL NABER						
Parameter	Pare L		Ì	11-41	11.		811-18	<b>H</b> -119	<b>H</b> -119	<b>#</b> -119	<b>₹</b>	<b>4</b> -120	¥-130
Multoring Zone			SHALOW	SPACLOW	SHALON	MEDIE	METE	883	2520	â	SHWILDH	SHALLON	MOTIMES
Date Sampled			04/30/86	10/20/86	10/20/86	03/25/86	10/21/86	03/05/86	03/05/86	10/20/86	04/20/86	10/13/86	10/13/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			04/22/86	10/22/86	10/22/86	03/31/86	10/22/86	03/15/85	03/12/86	10/22/86	04/22/86	10/17/86	10/11/86
<u>1</u>			Sec	SAC	SK	Sec	Sec	S	3	SKC	S	SKC	S
Field Amlysis				Æ	F1.8							É	90
Lab Aralysis								Ą	877				
Viryl chloride	2	1	2	2	2	2	2	2	2	2	Q	2	2
1,1-Dichloroethene	9	7	2	2	9	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	2	2	2	2	2		2	2	2
Chloreform	001	90	9.0	2.10	2.30	2	0.95	2	2	2	1.2	1.80	3:1
1,2-Dichloroethane	-	s	0.2	2	1.00	2	2	2	2	2	0.5	2	2
1,1,1-Trichlomethane	007	200	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	5	~	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	٠	S	17	190	210	2	1.0	2	2	2	77	200	300
Tet rachioroethere	4	Ä	2	2	2	2	2	2	2	2	2	2	2

ALI INITS AE ug/1

NA = Menteoring bell
FIN = First field deplicate analysis
FIN = Secont field deplicate analysis
LIN = First laboratory deplicate analysis
LIN = Secont laboratory deplicate analysis

ND = Nothing detected
C = Analysis confirmed in second column snalysis
NE = Not established

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento



SIMMEY OF COMPALY DETECTED ANALYTES IN HONTORING WELLS FROM 1981 TO 1988, MICLELAN APB

	SHO	U.S.EPA				**	ELL NUMBER			•	;		5
Parameter	Act ion Lavel	Primary M2.	M+120	<b>№</b> 120	<b>₹</b> 120	M+120	M+120	<b>M</b> -120	<b>4</b>	<b>1</b>	171-M	777	
Monitoring Zone			HOTMES	SHWILDIN	SHALOU	SHALOW	SHALLOW	SHALION	SHULOW	MEDIE	MINDLE	MINE	MEDIE
Date Semiled			01/20/87	01/20/87	04/20/87	08/08/87	10/22/87	01/23/88	01/23/88	02/26/86	10/13/86	01/23/87	06/25/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADILAN	RADIAN	RADIAN	RADIAN	RADIAN	KADIAN
Dare Analyzed			01/26/87	01/23/87	04/23/87	08/10/87	10/27/87	01/25/88	01/25/88	03/10/86	10/19/86	/8/62/10	18/8/9/
4			SAC	SK	3	Si	SKC	3	SKC	280	3	S.	2
Field Aralysis			Ą	873									
Lab Analysis								ğ	<b>9</b>				
10 mm - 1		-	5	9	5	2	2	2	2	2	2	2	2
TIME CARGE TOP	7	4 )	9 9	2 9	2 9	! 5	9	9	9	9	2	9	2
1,1-Dichloroethene	ø	_	5	2	5	5	€ !	2 !	<b>3</b> (	9 9	! 5	<b>5</b>	Ş
1,1-Dichloroethane	ଯ	Ä	2	2	2	2	2	2	5	⊋ !	2 9	2 9	? 9
Dioroform	81	001	0.900	0.850	0.770	0.680	0.50C	0.34C	0.380	5	2	2 !	5 8
2-Dichlorrerhane	_	<b>5</b> 71	2	2	2	2	2	0.190	0.200	2	2	2	2 :
	ξ	, &	9	9	Ş	5	9	2	2	2	2	2	2
I,I,I-Irichiologuage	3.	₹.	2 5	9	2 9	9	9	9	£	2	2	2	2
Larbon tetrachloride	ή ,	Α.	2 5	2 ;	<b>.</b>	ş ş	ر د و	ا ا	. N	0.2	2	2	2
Trichloroethene	•	'n	3	۲.۲	3	Ę	?	3	3	<b>.</b>	1	9	9
Terrachlomethere	4	닏	2	2	2	2	2	2	2	2	5	2	2

ALL UNITS ARE ug/1

M. = Menitoring Well

FIN = First field deplicate analysis

FIN = Second field deplicate analysis

LIM = First Laboratory deplicate analysis

LIM = Second Laboratory deplicate analysis

ND = Northing detected C = Avalysis confirmed in second column avalysis NE = Not established

RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento



SIMMEN OF COMPALY DETECTED ANALYTES IN MOUTHRING WELLS FROM 1961 TO 1988, HAZLELAN APB

	DORS	U.S.EPA	i				WELL NUMBER		•		3	2	M4.123
Parameter	Action Level	Primary NG.	<b>₩</b> +121	<b>M</b> +121	<b>14</b> -121	<b>17</b> -12	<b>₹</b> -122	<b>₹</b> -12	<b>₹</b>	<u> </u>	Z1- <b>≛</b>	771.47	
Menitoring Zone			MIDGE	MIDLE	MEDIE	2	200	2230	<b>8</b>	2230	2000	430	MOTIMES
Date Samled			08/07/82	10/22/87	01/23/88	02/26/86	11/12/86	01/26/87	05/07/87	08/08/87	10/22/87	01/23/88	04/04/00 04/04/00
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	MOLAN	KADIAN	KAULAN	KALUMY Se 10t 10t	01.000
Dare Analyzed			08/10/87	10/27/87	01/29/88	03/10/86	11/20/86	01/29/87	05/12/87	08/10/87	10/2//8/	8 (7 /T)	8 5 5
qeI			SK	Sec	Sc	SKC	S	3	S)	3	ž	ì	ì
Field Aralysis Lab Aralysis													
			9	5	9	5	9	£	2	2	2	2	2
VLTY1 CPLOCION	7	•	2 :	9 !	2 !	9 9		Ş	9	ş	ş	2	2
1,1-Dichlorcethane	•	7	2	2	2	2	2	5	9 !	9 !	2 5	1 5	5
1.1-Dichloroethane	8	¥	2	2	2	2	2	2	2	⊋ :	<b>5</b> i	2 9	2 6
Orlongton	901	100	9	2	2	2	2	2	2	<b>2</b>	2 !	2 :	
1 2-Dichloroethane		<b>∽</b>	2	2	2	2	2	2	2	2	2 !	2 9	2 9
1.1.1-Trichlomethane	500	æ	2	2	2	2	2	2	2	2	2	⊋ 9	2 9
Carbon regrachionide	•	<b>1</b> 0	2	2	2	2	2	2	2	2	2	2 !	2;
Tri chlamachan			2	£	2	2	2	2	2	2	2	2	3.1
Terroblomethere	۱ - 4	· <del>½</del>	9	2	2	2	2	2	2	2	2	2	2
	,			-									
I ATT TATE APE													
M. = Manitoring Well			2	RADIAN = Radian Corporation, Secramento	Corporation,	Secremento	z	D - Nothing detected	detected				
			ď	C * Radian	Analytical S	ervices, Secr	Cananto N	E - Not esta	blished				



SUMMEY OF COMPOSE, DETECTED ANALYTES IN MOUTHOUNG WELLS FROM 1981 TO 1988, MAJELLAN APB

	DOHS	Þ				2	ELL NUMBER						
Parameter	Act lon Level	Primary M.C.	₹-123	M4-124	<b>X</b> +124	<b>*</b> 27- <b>*</b>	₹- 12	M-126	<b>14</b> +127	M+127	N+128	₩+128	M+128
Manitoring Zone			SHILON	MEDIE	MODE	MEDIE	2200	DEEP	1622	aaa	SHALLOW	SHALON	MOTIMES
Date Sampled			10/21/86	02/25/86	11/24/86	11/24/86	02/25/86	03/03/86	03/04/86	10/24/86	12/05/86	01/16/87	04/16/87
Sampled By			RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADIAN
Date Analyzed			10/22/86	03/10/86	12/01/86	12/01/86	03/10/86	03/12/86	03/14/86	10/29/86	12/09/86	01/21/87	04/17/87
4			SK	SAC	Sec	38	SK	S	S	35	SKC	Sec	3
Field Aralysis													É
Lab Aralysis					¥G1	<b>8</b>							ļ
Virgi chloride	2	1	2	5	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	5.7JL	2	2
1.1-Dichloroethare	8	묏	0.210	2	2	2	2	2	2	2	1.41	2	1.20L
Chloroform	100	100	0.76	2	2	2	2	2	2	2	<b>,80</b>	2	3
1,2-Dichloroethane	-	٠	2	2	2	2	2	2	2	2	41DL	2	6301
1,1,1-Trichlomethane	200	<b>20</b>	2	0.5	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	۰	2	2	2	2	2	2	2	2	2	2	2
Trichlomethere	5	5	7.10	2	2	0.60	2	2	2	1.3	41000C	28200C	27000C
Tet rachloroethene	4	¥	2	2	2	2	2	2	2	o.15	2	2	1906
ALL UNITS ARE us/1													

194 = Peritoring 1611 FDA = First field deplicate analysis LDA = First laboratory deplicate analysis LDB = Second laboratory deplicate analysis

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
C = Analysis confirmed in second column analysis
II. = Diluted out of the confirmation run
NE = Not established



SLIMMEY OF COMPONLY DETECTED ANALYTES IN MONTHORING WELLS FROM 1981 TO 1988, MACIELLAN API

		U.S.EPA				_	HELL NUMBER						
Parameter	Level	Ę,		971-169	<b>8</b>	₹	<u> </u>	(Z)	€ [S	Z)	<u> </u>	£1.53	\$ <u>1</u>
Menitoring Zone			SHALON	MOTARS	SWICH	SWIO	SHALLON	MIDLE	MODE	MEDIE	HODE	MODLE	MEDILE
Date Sampled			04/16/87	08/12/87	09/17/87	10/23/87	01/13/88	12/05/86	01/16/87	04/15/87	08/12/87	10/23/87	01/13/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN
Date Analyzed			04/17/87	08/18/87	09/22/87	10/30/87	01/14/88	12/09/86	01/21/87	04/16/87	08/18/87	10/29/87	01/14/88
4			Sec	Sec	Sec	Sec	SK	SkC	S	S	S	Sk	9
Field Analysis			F138		ļ		ì	ì	ì	!	}	}	}
Lab Analysis													
inyl chloride	2	1	2	2	1.21.	2	2	2	2	2	2	2	2
,1-Dichloroethere	•	7	2	2	5.50	2	2	2	2	2	2	2	2
,1-Dichloroethave	8	<b>2</b>	1. 20L	2	1.20L	2	2	2	2	2	2	2	2
h-loroform	001	<b>1</b> 00	SEDI	2	5701	2	2	2	2	2	2	2	2
., 2-Dichloroethare	-	~	<b>2</b> 60t	2	750	2	2	2	2	2	2	2	2
,1.1-Trichloroethare	00 700	8	2	2	2	2	2	2	2	2	2	2	2
arbon tetrachloride	•	٠,	2	2	2	2	2	2	2	5	2	2	2
richloroethene	٠	2	5500C	200089	36000C	27000C	19000PC	130C	100	<b>28</b> 7	9100	35,	110
let rachiloroethere	4	¥	230	2	2	2	2	2	2	2	2	2	2

ALL UNITS AFE ug/1 M4 = Minitoring Hell FIB = Second field deplicate analysis

RADIAN = Radian Corporation, Sacramento SAC = Radian Aralytical Services, Sacramento

ND = Norhing detected
C = Analysis confirmed in second colum snalysis
DL = Diluxed out of the confirmation con
P or FC = Identity previously confirmed
NE = Not established



SIMMER OF COMPONEY DETECTED ANALYTES IN MONITORING MELLS FROM 1981 TO 1988, MALELLAN APB

	SHOO	U.S.EPA	_			3	EL NUMBER						
Parameter	Act ion Level	Action Primary Level MCL	M+130	M-130	M4-130	M4-130	M-130	M+130	M-130	M+130	<b>₩</b>	<b>14-</b> 131	<b>14-</b> 131
Monitoring Zone			223	aaa	2390	433	ã	đại đ	83 23	ĝ	SEMILON	MOTIMES	SHALLOW
Date Semied			11/13/86	01/16/87	04/15/87	07/29/87	07/29/87	10/27/87	10/27/87	01/13/88	11/19/86	11/19/86	01/19/87
Sampled By			RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/20/86	01/21/87	04/16/87	07/30/87	07/30/87	10/30/87	10/30/87	01/17/88	12/02/86	12/02/86	01/22/87
9			38	3	S	3	O.S.	3	35	35	Sec	SAC	SKC
Field Aralysis					ı	Æ	822	Æ	<b>82</b>		ě	<b>2</b>	Ą
Lab Analysis													
Viryl chloride	2		2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethene	•	_	3.20	8	6.1C	9	7.80	2.50	2.30	2.9PC	2	2	2
1.1-Dichloroethans	8	¥	7.80	2.80	7.60	nc	100	2.50	2.40	3.88C	2	2	2
Chloroform	100	901	2	2	0.430	2	2	0.230	0.280	0.29EC	0.17dL	2	2
1,2-Dichloroethare	-	•	2	2	2	2	2	2	2	2	2	2	2
1.1.1-Trichloroethane	200	900	0.970	0.80C	1.30	1.30	2	0.860	0.93C	0.61PC	2	0. 78EL	2
Carbon tetrachloride	٠,	٠,	2	2	2	5	2	2	2	2	2	2	2
Trichloroethene	•	s	2.60	3.1	3.20	4.0C	20.4	1.20	1.10	2.080	<b>3</b> )C	28C	361
Tet rachlomethere	4	Ä	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
M. = Monitoring Well			pt.	RADIAN = Radian Corporation, Sacramento	Corporation,	Sacramento		ND - Nothing detected	detected				
FLM = First field duplicate amalysis	ate amiysi	3	v)	WC = Radian	= Radian Analytical Services, Secramento	Pervloes, Sec	ramento	C = Analysi.	s confirmed t	Analysis confirmed in second column analysis	om analysis		
FIB = Second field depti	cate analys	sis						of - Diluted	out of the o	Diluted out of the confirmation to	<b>9</b> -		
								Por R = 1d	entity poevio	R = Identity previously continue	8		
								No. of New Party	serah) i shad				



SIMMEY OF COMPANY DETECTED, AWLYTES IN MONTHQUING WELLS FROM 1981 TO 1988, MOLEILAN APB

Parameter	DOHS U.S.EPA Action Primary Hill Level HO.	U.S.EPA Primary M.C.	M-131	M4-131	M+131	H-131	WELL NUMBER MA-131	M+131	M+132	<b>K</b> +132	<b>14</b> -132	M-132	M+132
Hruitoring Zone Date Sampled Sampled By Date Malyzed Lab Field Analysis			SHALLGW 01/19/87 RADIAN 01/22/87 SAC FDB	SHMLOH O4/28/87 RADIAN O4/30/87 SAC	SHULCH 08/07/87 RADIAN 08/13/87 SAC	SEMLICH 10/14/87 RADIAN 10/16/87 SAC FDA	SHALICH 10/14/87 RADIAN 10/16/87 SAC FUB	SEMICH 01/19/88 RADIAN 01/20/88 SAC	DESP 11/24/86 11/24/86 RADIAN 12/01/86 SAC	DESP 01/21/87 RADIAN 01/26/87 SAC	DEEP 05/15/87 RADIAN 05/19/87 SAC FDA	DEEP 05/15/87 RADIAN 05/19/87 SAC FUB	DEEP 07/29/87 RADIAN 07/30/87 SAC FDA
Viryl chloride	2	-	2	2	2	2	21	99	N C	2 9	2 2	2 2	2 2
1,1-Dichloroethere	۶ ص	_	2 9	2 9	2 5	2 2	2 2	2 2	2	2 2	2 2	2	2
1.1-Uchioceciane Olomform	3 2	ğ 9	§ <del>2</del>	9 2	2	2 2	2	0.300	0.51DL	2	2	2	2 !
1,2-Dichloroethane	-		2	2	2	2	2	0.31C	0.70DL	2	2 !	2 9	2 9
1,1,1-Trichlomethane	200	200	2	0.24C	2	2	2!	2 9	29	2 9	2 9	2 2	2 5
Carbon tetrachloride	Ś	Ś	2 5	2 %	2 :	2 5	<b>5</b> %	<b>3</b> 8	2 S	5 8	1000	2011	1100
Trichloroethere Tetrachloroethere	n -sr	n <b>9</b> 2	2	ž <u>2</u>	2	2	2	2	Q.	2	2	2	£
ALI UNITS ARE ug/1 194 - Minitoring Well 1958 - First field diplicate analysis 1958 - Secret field diplicate analysis	ate aralysi	21		RNDIAN = Radian Comporation, Sacramento SAC = Radian Analytical Services, Sacramento	Corporation	, Sacramento Services, Sac	rangito	ND = Nothing C = Analysi OL = Diluted NE = Not est	detected s cardiamed is out of the o	= Nothing detected = Analysis cardiamed in second column analysis = Dilized out of the confirmation run = Not established	m aralysis n		

B-65



SIMMRY OF COMPLEY DETECTED ANALYTES IN MANTIORING MELLS FROM 1981 TO 1988, MAJELLAN AFB

Action Primary M-132		MH-132	MLL132	M4120							
	大田田 中田 中				M+132	M4-133	M+134	<b>₹</b> -13¢	M+135	M4-136	M+136
		ß.	2330	1829	DEEP	1002	230	2230	MEDIE	DEEP	2330
		134/87	10/24/87	01/22/88	01/22/88	02/08/88	02/08/88	02/08/88	02/08/88	03/10/88	03/10/88
		NOIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
		10/29/87	10/29/87	01/25/88		02/10/88	02/10/88	02/10/88	02/10/88	03/15/88	
		و	SK	Sec	SS	S	Sec	S	Sec	S	8
Field Analysis FIB		*	503	1	l	ì	ļ	İ		ļ	
Lab Analysis			!				Ą	<b>8</b> 5			
Viryl chloride 2 1 ND	,		2	2	2	2	2	2	2	2	2
6 7		350	2	0.48PC	2	2	2	2	2	2	2
1,1-Dichloroethare 20 NE ND		_	2	2	2	2	2	2	2	2	5.1
Ohloroform 100 100 ND		_	2	2	6.0	2	2	2	0.960	2	2
-1			2	0.90PC	2	2	2	2	0.74C	2	2
1,1,1-Trichloroethane 200 200 ND		-	2	2	2	2	2	2	2	2	2
Carbon terrachloride 5 5 ND		_	2	2	2	2	5	2	2	2	2
Trichloroethere 5 5 1100		8	130	77FC	51.0	2	2	2	300	230C	22
Tetrachloroethere 4 NE ND		2	2	2	2	2	2	2	2	2	2
AL UNTS ARE ug/1 M = Monitorine Meil	RADIAN	Badlan	Compration	S. C.		O - Nobline deterte	1				1
FIA = First field deplicate analysis	B	- Canonie	CES = Caronie Environmental Services	al Services		C = Analysis	- Analysis confirmed in second column analysis	n second colum	n analysis		
UB = Second field deplicate analysis	Se	- Radian	Amalytical S	= Radian Analytical Services, Sacrament	•	Por PC = Identity previously confirmed	articy previo	asly confiana			
IA = First Laboratory deplicate gralysis						NE = Not est:	b) Lahad				



SIMMER OF COMPLEX DETECTED ANALYTISS IN MONTHQUIC WELLS FROM 1981 TO 1988, MCLELLAN APB

	200	U.S.EPA				3	EL NUMBER						
Parameter	8 -	Primacy M.C.	M4-137	MF-138	M4-138	<b>¥</b> -139	MF-140	M-141	M+142	M+143	MA-143	MH-1000	MH-1000
Monitoring Zone			1055	2230	2390	SHALLON	a	200	230	44	430	MIDLE	MIDDLE
Date Samled			02/10/88	03/11/88	03/11/88	02/09/88	02/09/88	02/09/88	02/09/88	02/10/88	02/10/88	12/12/85	03/07/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			02/11/88	03/15/88	03/15/88	02/10/88	02/10/88	02/10/88	02/10/88	02/11/88	02/11/88	12/21/85	03/14/86
4			Sec	SAC	S	35	35	SAC	SAC	SKC SKC	SK	<b>S</b>	3
Field Analysis				EG.	F18								
Lab Analysis										Ą	<b>8</b>		
Viral chloride	2	1	9	2	2	2	2	2	2	2	9	2	2
1-Dichlomerhere	ı ve	. ~	9	2	2	1.00	2	1.30	2	2	2	2	2
1-Dichlomerhane	۶,	<b>9</b>	7.70	2	2	9	2	5.30	2	2	2	2	2
Chloreform	100	100	9	9	2	1.10	2	2	2	2	2	2	2
2-Dichlomerhane		· -	2	2	2	1.80	2	2	2	2	2	2	2
1 1 -Trichlomerhane	, &	, 2	2	9	2	2	2	2	2	2	2	2	2
Carton terrachloride	٠,	٠.	9	2	2	2	2	2	2	2	2	2	2
Trichlomethere	, uri	• •	350C	2	2	26	98	200	2	2	2	2	2
let rachloroethere		Ä	2	2	2	2	2	2	2	Q	Q	2	2
AL UUTS AE ug/1  M. * Mentoring lel.!  FIA = First field deplicate aralysis  FIB = Second field deplicate aralysis  IIA = First laboratory deplicate aralysis  IIA = Second indicate aralysis	ate aralysi cate aralysi uplicate an	s lis alysis	AZ UT	RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Sac	n Corporat Ion n Analyt Ioal	- Radian Copporation, Secramento - Radian Analytical Services, Secramento	орина	ND = Nothing C = Analysi NE = Not est	"Nothing detected * Analysis confirmed in second column analysis * Not established	n second colu	m analysis		



SIMMRY OF COMMEN DETECTED ANALYTES IN MONTHOUNG WELLS FROM 1981 TO 1988, MICLELLAN APR

	SHDO	U.S.EPA				3	AL NAMER						
Parameter	Action	Primary MIL	M4-1000	M4-1000	M4-1000	<b>M4</b> -1000	M4-1000	M4-1000	<b>M</b> +1001	M+1001	M4-1001	<b>H</b> +1001	W-1001
Monttoring Zone			MODE	MODE	MEDIE	MODE	MOOLE	ADDLE	â	20	88	100	4390
Date Sampled			10/03/86	01/13/87	04/27/87	08/01/87	10/08/87	01/13/88	12/18/85	08/10/180	10/15/86	01/26/87	05/08/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/06/86	01/19/87	04/29/87	08/04/87	10/09/87	01/14/88	12/23/85	99/60/50	10/20/86	01/29/87	05/12/87
del			Š	SK	35	SKC	SAC	SK	S	Se	S	S	3
Field Analysis													
Lab Analysis													
Virgi chloride	2	1	2	8	2	2	£	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethane	8	ñ	2	2	2	2	2	2	2	2	2	2	2
Chloreform	100	901	2	2	2	2	2	2	2	2	2	2	æ
1,2-Dichloroethane	1	۰	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethere	200	88	0.838	2	2	2	2	2	2	2	2	2	2
Carbon terrachloride	'n	'n	2	2	2	2	2	2	2	2	2	2	2
Trichloroethens	\$	٠,	0.30	2	0.940	0.860	2	2	2	2	2	2	2
Tetrachloroethere	4	Ä	0.11	2	2	2	2	2	2	2	2	2	2
AL UNITS ARE ug/1 M = Menitoring Well			æ vi	ADIAN - Radia AC - Radia	RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento	, Sacramento Pervices, Saci	amento	NO = Nothing detected B = Compound detected C = Analysis confirm NE = Not established	detected I detected in confirmed in blished	Nothing detected Compound detected in laboratory blank - not edited Analysis confirmed in second colum analysis Not established	lark - not edi n analysis	 	



SIMMEY OF COMPONLY DETECTED ANNYTES IN HONTORING MELLS FROM 1981 TO 1988, HICLELLAN APB

Parameter	DORS Action Level	U.S.EPA Primary MCL	1001-144	M-1001	M-1001	##-1001	21. NIMBER M4-1001	M4-1001	M+1002	M+1002	<b>M</b> +1002	HH-1002	M-1002
Menitoring Zone Date Sampled			DEEP 08/08/87	10/09/87	10/09/87	01/20/88	DEEP 01/20/86	01/20/88	S#V1.04 11/07/85	11/07/85 12/07/85	SHALLOH 04/02/86	SHALOU 04/02/86 947744	SHALON 09/25/86 DADTAN
Sampled By			RADIAN 08/10/87	RADIAN 10/12/87	RADIAN 10/12/87	74014N 01/21/88	01/21/88	KADICAN	11/12/85	11/12/85	04/06/86	04/06/86	09/26/86
वरा			35	3	35	36	OF SE	8	3	)S	3 £	33 E	<b>3</b> 5
r teld watysis Lab Aralysis				Ą	<b>85</b>	<b>9</b>	¥Q1	<b>V</b> CTI	Ą	89			
Viryl chloride	2	1	2	2	2	2	2	9	2	2	2	2	2
1.1-Dichloroethene	•	۲	2	2	2	2	2	2	2.4	2.3	1.0	6.0	3.30
1.1-Dichlocoethane	8	Ę.	9	2	2	2	2	2	2	2	2	2	2
Orloroform	100	100	2	2	2	2	2	2	2	2	0.5	0.2	0.330
1,2-Dichloroethane	1	٠,	2	2	2	2	2	2	2	2	2 :	2 9	2 !
1,1,1-Trichloroethane	200	ଛ	2	2	2	2	2	2	2	2	2 !	2 9	2 9
Carbon tetrachloride	'n	ۍ	2	2	2	2	2	2	2	⊋ ∶	2	<b>2</b> ;	⊋ .
Trichloroethere	S	s	2	2	2	2	2	2	1.1	1.1	o. !		
Tet rachloroethene	4	2	9	2	2	2	2	2	2	2	5	5	2

ALI MATIS ARE ug/1

M. = Manitoring Well

FIA = First field deplicate analysis

FIB = Secord field deplicate analysis

LIA = First laboratory deplicate analysis

LIB = Secord laboratory deplicate analysis

ND = Nothing detacted
C = Aralysis confirmed in second column analysis
NE = Not established RADIAN = Radian Comporation, Secremento
CSS = Cercule Environmental Services
SAC = Radian Analytical Services, Secremento



SIMMEY OF COMPLY DETECTED ANLYTES IN MORTICIDIC MELLS FROM 1981 TO 1988, MICLELAN AFB

	9048	U.S.EPA				3	EL NIMBER						
Parameter	Act ion Level	Primery MCL	M4-1002	M4-1002	M4-1002	M+1002	M4-1002	<b>M</b> -1003	<b>M</b> +1003	M+1003	MH-1003	M4-1003	M+1003
Manitoring Zane			SHALOU	SHALLOW	SHALLOW	SPALION	SPALION	MEDIE	MEDIE	MODE	MODIE	MODEE	MODIE
Date Sampled			02/04/87	05/04/87	08/08/87	10/15/87	01/21/88	12/18/85	03/18/86	10/15/86	01/23/87	05/08/87	08/08/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN
Date Analyzed			02/06/87	05/06/87	08/10/87	10/19/87	01/22/88	27/23/85	03/26/86	10/20/86	01/27/87	05/12/87	78/11/80
वहा			35	35	Sec	S	S	S	Sec	SKC	S	3	5
Field Amplysis Lab Amplysis						ı		}	<b> </b>	}	}	)	1 1
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	Ş	5
1,1-Dichloroethere	9	7	2	2	1.80	0.980	0.980	2	2	0.160	2	2	9
1,1-Dichloroethane	ន	¥	2	2	2	2	2	2	2	2	2	2	9
Chloreform	<b>8</b>	90	2	2	5	0.160	0.16PC	2	2	2	2	2	2
1,2-Dichloroethane	-	5	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	900	2	2	0.430	2	2	2	2	2	2	2	2
Carbon tetrachloride	s	2	2	2	2	2	2	2	0.2	2	2	2	2
<b>Frichloroethere</b>	s	s	2	1.30	2	0.320	0.3980	9	2	2	2	2	2
Tet rachlomethene	4	¥	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1 M4 = Minitoring Hell LDA = First laboratory deplicate analysis	Aplicace au	sisyls	25	RADIAN = Radian Cosporation, Secremento SAC = Radian Amalytical Services, Sa	Corporation, Analytical S	Radian Corporation, Secramento Radian Avalytical Services, Secrament	Camerito	D = Nothing detected  D = Analysis confirm  P or F = Identity pr	detected s confilmed to smally previous	Nothing detected Analysis confirmed in second column emalysis FC = Identity previously confirmed New entablished	n emlysis		



SIMMER OF COMMUNE DETECTED ANALYTES IN MONTHRIDG MELLS FROM 1961 TO 1988, MATELLAN API

	SHOO	U.S.EPA				3	EL NIMBER						
Parameter	Action Level	Primary 1	MH-1003	M-1003	M4-1003	M4-1004	M4-1004	M-1004	M4-1004	M-1004	7001 <b>-™</b>	M4-1004	M-1006
Monitoring Zone			MEDIE	MINE	MIDLE	SHALON	SHALON	NOTIMES	SHILO	SHALOW	SHALON	SHWLOW	SPALIO
Date Sampled			08/08/87	10/09/87	01/20/88	12/18/85	12/18/85	03/38/86	09/29/86	09/29/86	01/26/87	05/08/87	08/08/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			08/11/87	10/12/87	01/21/88	12/23/85	12/23/85	03/20/86	10/02/86	10/02/86	02/05/87	05/12/87	08/11/80
Tab			SAC	SWC	38	35	S	Sec	S	Se	S	Sec	3
Field Analysis				ŀ	ļ				é	85			
Lab Analysis			<b>5</b>			Ą	<b>9</b>						
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
.,1-Dichloroethene	•	7	2	2	2	27	S	ጽ	100C	216	28	1600	7200
.,1-Dichloroethane	8	2	2	2	9	=	2	7.3	<b>8</b> .70	32.6	8.1C	9.80	6.30
Chloroform	100	901	2	2	2	2	2	0.2	2	2	2	2	2
.,2-Dichloroethane	1	s	2	2	2	2	2	0.7	1.90	2	2	2	2
1,1,1-Trichloroethane	200	200	2	2	2	2.1	2.1	3.2	1.4C	1.30	1.70	2	2
Carton tetrachloride	s	S	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	۰ς	ş	2	2	2	14	16	15	<b>3</b> 6C	32	287	270	24C
Tetrachlomethere	4	Ē	2	2	2	2	9	2	2	2	2	Ð	2
ALL BUTTS ARE ug/1 M = Mentering Mell FDA = First field deplicate avalysis FDB = Second field deplicate avalysis LDA = First laboratory deplicate avalys LDB = Second laboratory deplicate avalys	ate aralysi cate aralys uplicate ara	s tis suysis	& ઝ	RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Sac	Radian Comporation, Secremento Radian Analytical Services, Secremento	Secremento Services, Secr		ND = Nothing C = Analysia NE = Not est.	= Nothing detected = Analysis confirmed in second column analysis = Not established	secard colur	n analysis		

## RADIAN

SLWHEK OF COMCHE, DEDECTED AWLYTES IN MINITORING WELLS FROM 1981 TO 1988, MCLEILAN APB

Prometer	OCHS Action Level	DORS U.S.EPA Action Primary I	<b>H</b> -1004	H4-1004	<b>144-</b> 1004	5001-FM	WELL NUMBER MA-1005	¥4-1005	M+1005	5001-196	S001-4#	M4-1005	N#-1005
Monitoring Zone Date Sampled Sampled By Date Malyzed Lab Field Malyzed 1 th Amelyzed			SPALICH 10/09/87 RADIAN 10/12/87 SAC FDA	SHALLOH 10/09/87 RADIAN 10/13/87 SAC FDB	SHALCH 01/20/88 RADIAN 01/21/88	SHALON 12/17/85 RADIAN 12/23/85 SAC	SHALIGH 03/14/86 RADIAN 03/19/86 SAC	SEMILON 03/14/86 PADIAN 03/19/86 SAC	SEWILON 09/25/86 RADIAN 09/29/86 SAC FIN	5540,104 09/25/86 09/25/86 59/25/86	SPALICH 01/09/87 RADIAN 01/19/87 SAC FDA	SHV104 01/09/87 FM01AH 01/19/87 SAC FDB	SHIDN O4/16/87 RADIAN O4/20/87 SAC FDA
Viryl chloride 1,1-0ichlocothers 1,1-0ichlocothers 1,1-0ichlocothers 1,1,1-Titchlocothers 1,1,1-Titchlocothers Trichlocothers Tetchlocothers Tetchlocothers	2 28 28 100 1100 200 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ND 41C 2.4C 0.24C 0.79C 0.79C 0.90C ND ND ND ND ND ND ND ND ND ND ND ND ND	NO 1.10 1.10 NO 1.20 N	ND 239C 1.6PC NO 0.40PC 0.6PC 0.6PC NO 0.6PC NO NO NO NO NO NO NO NO NO NO NO NO NO	66 166 2.7.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3.0 3	8 8 8 8 6 1 1 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	5 8 8 9 8 8 9 8 8 9 8 9 8 9 8 9 9 8 9	0.41NC 110C 28C 1.2NC 14C 1.7NC ND 80C 0.32NC	0.43C 110C 25C 2.88C 110C 1.08C 10 76C 0.338C	NO 1000 120 0.580 5.70 2.60 80 0.200	ND 102C 123C ND ND ND ND ND ND ND ND ND ND ND ND ND	85 125 125 80 6.00 3.30 830 9.260
AL UNITS ARE ug/1  NA = Manicoring Well  FIA = First field deplicate analysis  FIB = Second field deplicate analysis  IIA = First laboratory deplicate analysis  IIB = Second laboratory deplicate analysis	cate aralyzi	ta sis ralysis selysis		RADIAN = Radian Corporation, Secremento SAC = Radian Aralytical Services, Sac	Radian Cosporation, Secremento Radian Analytical Services, Secremento	n, Secremento Services, Sa	Cramerico	NC = Result NO = Vorbing B = Compou EL = Dillica P or PC = E	NC = Result was not confirmed in second column analysis ND = Northing detected B = Compound detected in laboratory blank - not edited R = Dilinead out of the confirmation run P or RC = Identity previously confirmed NE = Not established	uned in secon a laboratory t confirmation a	olum and Slank - not er no	lysis iltrad	



SIMMRY OF CHACKLY DETECTED AMAYTES IN MOUTICADIC WELLS FROM 1961 TO 1988, NACIELLAN API

Parameter	Action Prin	U.S.EPA Primary M.L.	MH-1005	M-1005	M-1005	M-1005	FIL NUMBER 144-1005	M4-1005	MH-1005	₩-1005	₩-1009	M+1009	₩+1009
Menitoring Zone			SHALLOW	SHILOW	SHILLOW	SHALLON	SHULOW	SHALON	MOTIMES	SHALIGN	MOTARS	MOTMES	MOTANS
Pate Sampled			04/16/87	04/16/87	07/31/87	07/31/87	10/15/87	10/15/87	01/19/88	01/19/88	12/19/85	03/21/86	10/09/86
Sampled By			RADIAN	RADIAN	PACIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN
Date Analyzed			04/20/87	04/21/87	08/03/87	08/03/87	10/19/87	10/19/87	01/20/88	01/20/86	12/23/85	04/01/86	10/13/86
Leb G			SEC	SK.	S	S. C.	8	SKC	3	35	3	S	SKC
Field Amlysis			F138	200	Ž.		Æ	873	FDA	92	ļ	) }	}
Lab Analysis			<b>S</b>	<b>5</b>		1	İ	!	ļ				
lryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	140C	1500	270C	2800	ž	27.	28	SIRC	2	2	2
1,1-Dichloroethane	8	낼	270	160	361	24C	7.50	6.4C	5.2PC	5.2PC	2	2	2
Ohloroform	901	90	2	9	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	-	٠	36.7	6.0C	2	2	5.10	3.80	2.2PC	2.0PC	2	2	2
1,1,1-Trichloroethane	98	000	4.30	3.30	2.30	2	2	2	2	2	2	2	2
Carbon tetrachloride	•	٠	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	•	٠,	<b>3</b> 20	<b>3</b> 5	37	980	22	Ø	14PC	<b>15</b>	2	2	2
let rachloroethere	4	Ä	0.370	<b>3</b> .0	2	2	2	2	2	2	2	2	2

ALL UNITS ARE ug/1

HW = Munitoring Well

FIA = First field deplicate analysis

FIB = Second field deplicate analysis

LIA = First laboratory deplicate analysis

LIB = Second laboratory deplicate analysis

ND = Nothing detected
C = Analysis confirmed in second column analysis
P or PC = Identity previously confirmed
NE = Not established

RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Secremento

SIMMER OF CIMPLRY DETECTED ANALYTES IN MINITIDATING WELLS TROM 1981 TO 1988, MISTELLAN API

	DOBS	U.S.EPA Primacy	M4-1009	M+1009	M+1009	M+1009	HELL NUMBER MM-1009	MH-1009	M+1010	M4-1010	M+1010	M4-1010	M+1010
Parameter	[we]	벛											
Menitoring Zone			SPALION	SPWLOU	ADTIMES	SPALON	MATCH	SPALION	MILE	MEDILE	MINITE	MIDLE	MEDICE
Date Sampled			02/03/87	04/17/87	07/31/87	10/15/87	01/18/88	01/18/88	04/08/86	98/80/10	10/23/86	01/13/80	05/04/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			02/05/87	04/21/87	08/03/87	10/19/87	01/19/88	01/19/88	04/10/86	04/10/86	10/24/86	01/19/87	05/06/87
4			35	SAC	38	SAC	SKC	S	S	35	3	SK	Si
Field Analysis Lab Analysis							Æ	æ	<b>E</b>	£			
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethere	φ	1	2	2	2	2	ð	2	2	2	2	2	2
1,1-Dichloroethane	8	2	5	2	2	Ş	2	2	2	2	2	2	2
Orloraform	100	90	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	~	s	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethane	500	80	2	2	£	5	2	2	2	2	2	2	2
Carbon tetrachloride	ξ	ۍ	2	2	2	2	2	£	2	2	2	2	2
Trichloroethere	٠,	٠,	2	2	2	2	2	2	2	2	2	2	2
Tet rachlomethere	4	2	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1				W-0-1									
M = Manitoring Well			\$	DIAN = Radian	RADIAN = Radian Corporation, Secramento	Secremento,	_	ND = Nothing detected	detected				
FDA = First field deplicate arelysis	ate arelysi	•	\$	C * Radian	n Analytical 1	Services, Sec	Camerico	NE = Not est	ablished				
FUB = Second fileld deplicate analysis	cate analys	3											



SLIMMRY OF COMPLEX DETECTED ANALYTES IN HONTINGING WELLS FROM 1981 TO 1988, MACLELLAN APB

	3	0.5	•				ST NEWS						
Parameter	Action Level	Primary M2	y M4-1010	M4-1010	M-1010	<b>M</b> +1011	<b>M-</b> 1011	M-1011	<b>M</b> -1011	M4-1011	M4-1011	M-1011	M-1011
Manitoring Zone			MODIE	MEDIE	MEDILE	SPALLOW	SHALLON	SHALLON	SHWLLGH	SENCTON	SHALLOW	SHWIDW	MOTMES
Date Sampled			07/31/87	10/15/87	01/18/88	11/05/85	03/27/86	10/06/86	01/06/87	04/27/87	08/05/87	10/22/87	01/25/88
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			08/03/87	10/18/87	01/19/88	11/11/85	03/31/86	10/09/86	01/08/87	04/29/87	08/07/87	10/28/87	01/27/88
व			SAC	SAC	S	5	S	3	3	5	3	S	5
Field Aralysis				ļ	l l		ļ	) 	l i	l 3	ì	ì	}
Lab Analysis													
Viryl chloride	2	-	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	ଛ	발	2	2	2	2	2	2	2	2	2	2	2
Chlorofoan	100	901	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethare	-	2	2	2	æ	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	8	2	2	9	2	2	2	2	2	2	0.250	2
Carbon tetrachloride	'n	5	2	2	2	2	2	2	2	2	2	2	9
Trichloroethere	'n	5	2	2	2	2	2	2	2	2	2	2	2
Tet rach lowethere	4	¥	2	2	2	2	2	2	2	2	2	2	2
AL UNITS ARE ug/1			N A	MAN = Dadie				. Mehin					
			8 3	- Radian	SAC = Radian Analytical Services, Secramento	ervices, Seci	_	C = Analysis confir	s confirmed in	Analysis confirmed in second column analysis Not second column analysis	n aralysis		
							•	ľ					



SIMMEY OF COMPORTY DETECTED AWLYTES IN HONTORING WELLS FROM 1981 TO 1988, MICLELAN APB

	200	U.S.EPA				3	11. NUMBER						
Parameter	Action Level	F A	M-1012	M+1012	M4-1012	M-1012	M-1012	<b>№</b> -1012	M4-1012	M-1012	M-1013	M-1013	M+1013
Menitoring Zone			SHALLOW	SHWITON	MOTANIS	MOTANS	SHALIGH	SHALOU	SHAIOL	SHALLOU	SHATTOU	CHAILOU	SHE LOL
Date Semiled			11/15/85	03/06/86	98/77/60	CR/25/R7	05/05/87	08/26/20	10/26/87	00/1C/W	11/12/06	30/11/60	2010101
Samiled By			PADTAN	PAUTAN	PADTAN	PADIAN	DADTAN	DADTAN	DATTAR	DATA.	DADTAN	03/11/00 nepter	20/0/00
Pare Analyzed			11 (20/85	20/17/00	70/36/06	10/10/ W	C6/20/30	02/20/50	10/00/01	MACANA COLOR	Marian	NALLAN POLICE	INC. LAW
q q			Sec. 19	8	ON COL	SEC. 2012	(8) (S)	) (a) (a) (b) (a) (a) (b) (a) (a) (a) (a) (a) (a) (a) (a) (a) (a	10/23/01 S4C	<b>8</b> /7/70	11/12/85 CAY	03/18/00	10/13/86
Field Aralysis			ì	}	) i	ì	2	}	}	}	ì	ì	š
Lab Analysis													
Viryl chloride	2	1	2	2	2	5	9	2	2	2	9	2	9
1,1-Dichloroethere	9	,	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	2	2	2	2
Ohloroform	001	001	2	2	2	2	2	9	2	2	2	2	2
1,2-Dichloroethane	-1	ۍ	2	2	2	2	2	9	2	2	2	2	2
1.1,1-Trichlomethare	800	90	2	0.2	2	2	2	2	0.28C	2	2	2	2
Carbon tetrachloride	'n	ş	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	S	ş	2	2	2	2	2	2	2	2	2	2	2
Tetrachloroethere	4	¥	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE 18/1													
MW = Monitoring Well			2	VOLAN - Radian	Corporation,	Sacramento	Z	D = Nothing detected	detected				
			ðs	AC = Radian	SAC = Radian Amalytical Services, Sacramento	ervices, Sacr		C = Aralysis confiu NE = Not established	confirmed in	Analysis confirmed in second column analysis Not established	n analysis		

# RADIAN

SIMMER OF CHACKLY DETECTED ANALYTES IN MOUTHCRING WELLS THOM 1981 TO 1988, MACKLIAN API

Parameter	DONS Action Level	U.S.EPA Primary MT.	1 MF-1013	M+1013	M-1013	M-1013	ELL NUMBER MA-1013	M4-1013	M+1013	M-1013	M4-1013	M-1014	M#-1014
Maniporite Zene			OF TABLE	CHW 10L	GENETAL	G18410-	COLIVER	COLVE	- Contract			101100	(F. 1916)
771-13			10, 11, 10	100,00		e de la constante de la consta	100		1	ALL THE	ALL THE	NAME OF THE PARTY	1
uate sampled			/R/C/10	8/02/30	(R/0Z/%)	04/20/87	08/03/87	08/03/80	10/22/87	10/22/87	01/19/88	11/14/85	11/14/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			01/20/87	04/22/87	04/22/87	04/22/87	08/06/87	08/06/80	10/28/87	10/28/87	01/20/88	11/15/85	11/22/85
<b>qe</b> 1			SK	SkC	Se	Sk	S	38	3	38	S	35	SKC
Field Analysis				Ą	F1.8	9 <u>7</u> 8							
Lab Analysis					ğ	<b>8</b>	ğ	<b>8</b> 1	á	83		41	<b>9</b>
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	띨	9	5	2	2	2	2	2	2	2	2	2
Chloroform	8	8	2	2	2	2	2	2	2	2	2	2	2
1.2-Dichloroethane	~	2	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	G <b>5</b> 00	8	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	s.	٠	2	9	2	2	2	2	2	5	2	2	2
Trichloroethere	s	•	2	2	2	2	2	2	2	2	2	2	2
Tet rachioroethane	4	Ä	2	2	2	2	2	2	2	2	2	2	2

ALL UNITS ARE ug/1

144 = Manitoring Well

150 = First field deplicate analysis

158 = Secord field deplicate analysis

158 = Secord field deplicate analysis

158 = Secord laboratory deplicate analysis

158 = Secord laboratory deplicate analysis

RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento

ND = Nothing detected NE = Not established



SLIMMEN OF COMPOULY DETECTED AMELYTES IN MONTHRING WELLS FROM 1981 TO 1988, MACLELLAN APB

Parameter	DORS Action Level	S U.S.EPA ion Primary M4-	. MJ-1014	<b>M</b> 4-1014	<b>MJ-</b> 1014	9101-194 7101-194	4511 NA-858 14-1014	<b>HA</b> -1014	M-1014	M4-1015	M4-1015	M4-1015	M-1015
Mrnitoring Zone Date Sampled Sampled By Date Aralyzed Lab Field Aralysis			SHALLCH 03/12/86 RADIAN 03/18/86 SAC	SHALCH 10/06/86 RADIAN 10/09/86 SAC	SW1104 01/16/87 RADIAN 01/21/87 SAC	SHALICH CA.[27]87 PADIAN CA.[29]87 SAC	SHALLCH 08/01/87 RADIAN 08/05/87 SAC	SEWICH 10/26/87 10/26/87 10/29/87 SAC	SHLLGH 01/25/88 RADIAN 01/27/88 SAC	MIDDLE 12/14/85 RADIAN 12/21/85 SAC	MIDILE 03/25/86 RADIAN 03/31/86 SAC	MIDILE 10/07/86 RADIAN 10/10/86 SAC	MIDILE 01/14/87 RADIAN 01/20/87 SAC
Viryl chloride	61		2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	2	9	2	2
Chloroform	901	<b>0</b>	2	2	<del>2</del>	2	2	2	2	2	2	9	2
1,2-Dichloroethane	-	٠	2	2	2	<del>2</del>	2	2	2	2	9	2	2
1,1,1-Trichloroethane	200	8	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	5	٠	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	5	~	2	2	2	2	2	2	2	2	2	2	2
Tetrachloroethene	4	Ä	2	2	2	2	2	2	2	2	2	0.1	2
AL UNITS ARE ug/1 M = Mraitoring Well			23	RADIAN = Radian Corporation, Secremento SAC = Radian Analytical Services, Secremento	Corporation, Analytical S	Secremento ervices, Secre	o o marito	D * Nothing detected E = Not established	detected blished				



SIMMAY OF COMPLY DETECTED AMILTES IN MANTICATIC WELLS FROM 1981 TO 1988, MCLELLAN APB

	SADO	U.S.EPA					IL NIMBER						
Parameter	Act ion Level	Primary MCL	M-1015	M-1015	M4-1015	M-1015	MH-1016	M4-1016	M4-1016	M4-1016	M-1016	M-1016	M4-1016
Manitoring Zone			MOUE	ME	MODLE	MODE	SHALLOW	SHALON	SHALLON	SHALON	SHALON	SHULON	SHALOW
Date Sampled			05/04/87	08/01/82	10/17/87	01/19/88	11/14/85	03/12/86	10/01/86	01/16/87	05/07/87	08/01/80	10/16/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			05/06/87	08/02/80	10/20/87	01/20/88	11/2/85	03/18/86	98/60/01	01/21/87	05/11/87	08/02/80	10/20/87
वला			360	St	38	S	Sec	SKC	35	SAC	S	Sec	SKC
Field Analysis													
Lab Analysis													Ę
Viryl chloride	2	1	2	2	9	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	R	¥	2	2	2	2	2	2	2	2	2	2	2
Orloraform	100	<u>0</u>	2	2	2	2	2	2	0.11	2	0.33	2	2
1,2-Dichloroethane	г	٠	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	300	ģ	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	<b>م</b>	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	'n	s,	2	2	2	2	2	2	2	2	2	2	2
Tetrachloroethere	4	일	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1													
Mw = Manitoring Well			ā	VDIAN = Radian	Corporat ion,	Sacramento	-	NO - Nothing	detected				
LDA = First laboratory duplicate analysis	uplicate an	sisyle	35	SAC = Radian Analytical Services, Secramento	Analytical S	Pervices, Secu	_	NE = Not established	ablished				



SIMMER OF COMPALY DETECTED ANALYTISS IN MATTERIAC WELLS FROM 1981 TO 1988, MACELLAN AFB

	DORES	U.S.EPA					21. NUMBER						
Parameter	Act ion Level	Action Primary Level M.L.	, M-1016	M-1016	M+1017	M+1017	M-1017	M-1017	M+1017	M+1017	MA-1017	M4-1017	M-1018
Manitoring Zone			SHALLCH	SHALON	SHALON	SHILOW	SHALLON	SHALON	SHALON	SHALOW	SHALOW	SHALOW	MOTARS
Date Sampled			10/16/87	01/12/88	11/08/85	03/18/86	09/23/86	01/20/87	04/20/87	07/28/87	10/11/87	01/21/88	11/18/85
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/20/87	01/13/88	11/12/85	03/20/86	09/24/86	01/26/87	04/22/87	07/29/87	10/20/87	01/22/88	11/24/85
qe'l			SAC	SAC	SKC	SAC	Se	SK	38	Sec	Sec	S&C	Sec
Field Analysis													
Lab Analysis			<b>8</b> 53										
Viryl chloride	2		2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	Ð	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethane	23	2	2	2	2	2	2	2	2	5	Ð	2	2
Chloroform	100	901	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane		5	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethere	300	300	2	2	2	2	2	2	2	2	2	2	9
Carbon tetrachloride	'n	5	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	s	٠	5	2	2	2	2	£	2	2	9	2	(0.7)
Tet rachloroethere	7	Ä	ଚ୍ଚ	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE UE/I				-									
M = Minitoring Well			æ	RADIAN = Radian Corporation, Sacramento	Corporation,	Sacramento		ND = Nothing detected	detected				
J.B = Second Laboratory	duplicate a	malvsis	ď	*C ≭ Radian	Analytical	Total Section		VE = Not est.	ablished				



SIMMEN OF COMPLEX DETECTED ANALYTES IN HONTTORING MELLS FROM 1981 TO 1988, MICLIELLAN AFB

	200	U.S.EPA				3	II. NIMBER						
Paramet er	Act ion Level	Pr.	M-1018	M+1018	M-1018	M4-1018	M-1018	M+1018	M4-1018	M+1019	<b>M-1</b> 019	<b>M</b> -1019	M-1019
Manitoring Zane			SHALON	SHALON	SHW10H	SHALIGH	SHALION	SWITCH	SHALON	SHALON	SHALOW	SHALON	SHALLON
Date Sampled			03/12/86	09/23/86	02/04/87	05/01/87	08/04/87	10/08/87	01/14/88	12/19/85	08/60/90	09/54/86	01/09/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADEAN	RADIAN	RADIAN
Date Analyzed			03/18/86	09/54/86	02/05/87	05/05/87	08/07/87	10/09/87	01/15/88	12/23/85	04/10/86	09/26/86	01/16/87
de.l			SAC	S	25	380	SAC	3	28	ş	SS	S	SkC
Field Aralysis													
Lab Analysis													
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethans	20	¥	2	2	2	2	2	2	2	2	9.0	O. SIZINC	0.590
Chloreform	100	100	0.1	0.17	2	2	2	0.130	0.10PC	0.5	0.1	0.56NC	0.170
1,2-Dichlorcethane	-	2	9	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethane	200	300	2	2	2	2	2	2	2	2	0.2	2	2
Carbon tetrachloride	\$	5	2	9	2	2	2	2	2	2	2	2	2
Trichloroethane	٠,	5	0.7	ð. 0	2	1.70	1.4C	0.570	O.SAPC	0.5	2.0	39.1	1.30
Tet rachlomethere	4	¥	9	2	2	2	2	2	2	2	4.0	2	0.220
AL UNIS ARE ug/1 M = Mrutcoring bell			2.71	RNJAN = Radian Corporation, Sacramento SAC = Radian Aralytical Services, Sa	Corporation,	- Radian Corporation, Sacramento - Radian Analytical Services, Sacramento	22.42	C = Result v O = Nothing or PC = Ide	C = Result was not confirmed in second D = Northing detected or FC = Identity previously confirmed E = Not established	med in second	C = Result was rot confirmed in second column analysis D = Norbing detected or R = Ideratly previously confirmed E = Not established	ર્ગ દ	



SIMMEN OF COMPILY DETECTED ANALYTES IN MONTRORING WELLS FROM 1981 TO 1988, MAJELLAN APE

	_ ا	U.S.EPA Primary	U.S.EPA Primary M4-1019	<b>M</b> M-1019	M-1019	34 1019 144-1019	WELL NUMBER 194-1019	M-1019	M+1030	M-1020	M+1020	M4-1020	<b>M</b> +1020
Parameter	Level	į									CONTROL	SHAT OU	MOTANS
Menitoring Zone Date Sampled Sampled By Date Analyzed Lab Field Medysis			SHALOH 04/20/87 RADIAN 04/2/87 SAC FDA	SHM.104 04/20/87 RMDXAH 04/22/87 SAC FUB	SHALICA 08/07/87 -RADIAN 08/13/87 SAC	SHALDH 10/21/87 RADIAN 10/28/87 SAC	SHALLOW 01/25/88 RADIAN 01/27/88 SAC FDA	SW104 01/25/88 RADIAN 01/27/88 SAC FTB	SPALION 11/08/85 RADIAN 11/12/85 SAC	24/10/2 03/07/86 03/14/86 5AC	10/03/86 RADIAN 10/06/86 SAC	10/03/86 RADIAN 10/06/86 SAC	01/13/87 RADIAN 01/19/87 SAC
Viryl chloride 1.1-Dichloroethere 1.1-Dichloroethere 1.2-Dichloroethere 1.2-Dichloroethere 1.1.1-Trichloroethere Trichloroethere Terachloroethere	2 20 20 100 100 200 200 200 200 200 2 5 5 5 5	1 7 M 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	NO NO 2.00 9.310 NO NO NO NO 2.60 1.10	2.16 0.386 0.386 NO NO NO NO 1.16	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	8 8 9 1.46 9 1.3	NO 0.11C 1.3C 0.30C NO NO NO NO NO NO NO NO NO NO NO NO NO	NO 0.10C 1.3C 0.26C NO NO NO NO 1.3C 0.53C	222222222	<b>33535555</b>	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	22222222	2222222
AL UNIS ARE ug/1  M = Menitoring Well  FrA = First field deplicate analysis  FIR = Scord field deplicate analysis  FIR = Scord field deplicate analysis  TOA = First taboratory deplicate analysis  TOA = Coront taboratory deplicate analysis	cate aralys loate araly hplicate a	sis sis sisvlen		RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sac	an Corporation an Analytical	= Radian Corporation, Secremento = Radian Aralytical Services, Secremento	cranerto	ND = Nothin B = Compou C = Analys NE = Not es	<ul> <li>Nothing detected</li> <li>Compared detected in laboratory blank - rox edited</li> <li>Analysis confirmed in second column analysis</li> <li>Not established</li> </ul>	n Laboratory in second col	blark - rot e um eralysis	dicad	



SIMMEN OF COMPLEX DETECTED AMAZTES IN MONTHORING WELLS FROM 1981 TO 1988, MACLELLAN APE

				The same of the same of									
Parameter	DOHS Action Level	DOHS U.S.FYA Action Primary Level M.L.	M-1020	MH-1020	M-1020	34 0201- <b>144</b>	51, NIPRER 94-1020	M4-1021	<b>1001-48</b>	<b>1001</b>	1021	<b>14-1</b> 021	M+1021
Mentroring Zene Date Sampled Sampled By Date Analyzed Lab Fleid Analysis Lab Analysis			SWLICH 04/30/87 RADIAN 05/04/87 SAC	SHVLCH 08/03/87 RADIAN 08/05/87 SAC	SEMILOH 10/08/87 10/09/87 10/09/87 SAC	SHW1.CH 01/13/88 RADIAN 01/14/88 SAC FDA	SPALICH 01/13/88 RADIAN 01/14/88 SAC FIDS	SHWIDH 11/07/86 RADIAN 11/20/86	SHVLON 01/26/87 RADIAN 02/03/87 SAC LDA	SHALICH 01/26/87 PADLAN 02/03/87 SAC LUB	SHALCH 04/27/87 RADIAN 04/29/87 SAC	SHV1.CM CB/03/87 RADIAN CB/07/87 SAC	SHALIGN 10/27/87 RADIAN 11/02/87 SAC
Viryl chloride	7	-	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	କ୍ଷ		2	2	2	2	2	2	2	2	2	2	2
Chloraform	100		2	2	2	2	9	0.230	9	9	9	9	361.0
1,2-Dichloroethane	-	\$	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethere	<b>500</b>		2	2	2	2	2	2	2	2	2	2	9
Carbon tetrachloride	'n	Ş	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	٠,	ۍ	0.300	2	2	2	2	570	33	R	570	293	130
Tetrachloroethere	4	Æ	2	2	9	2	2	2.80	2	2	3.60	2.70	3.30
Att 18779C ATC													

AL UNIS AND ug/1

M. = Minitoring Mell
FIM = First field diplicate analysis
FIM = Scord field diplicate analysis
LIM = First Leboratory diplicate analysis
LIM = First Leboratory diplicate analysis
LIM = Secret Laboratory diplicate analysis

ND = Northing detacted
C = Analysis confirmed in second column analysis
NE = Not established RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento



SIMMER OF COMPLEX DETECTED ANALYTES IN MULTIPRING MELLS FROM 1981 TO 1988, MCLELLAN APB

	DORS Action		M-1021	M4-1021	₩+1022	M-1022	HELL NUMBER M4-1022	M+1022	<b>102</b>	<b>M</b> +1022	M-1022	₩-1023	<b>14</b> -1023
	Tener	į											
Manitorine Zene			SWIDE	G. W.C.	MITTER	MITTE	MINE	MEDICE	MUDITE	MODE	MINIE	SHALLOW	SWIDN
Pres Sampled			10/27/01	90/01/10	30/00/11	C8/5C/ W	04/27/87	08/03/80	10/20/87	10/20/87	01/19/88	11/04/86	01/19/87
mardine auto			10/2/10	D 121170	21/0/100		in the same	Dantan	DADYAN	DADTAN	DADTAN	DADTAN	PADTAN
Nampled By			KACKA KACKA	KADIAN	KADIAN		MACINA	KALLAN		MOTO		100,000	100,000
Date Analyzed			11/04/87	01/20/88	11/11/86	01/27/87	04/29/87	08/06/87	10/23/87	11/24/87	01/20/88	11/09/00	01/29/8/
वहा			æ	Sec	3	SK	SAC	3	S	8	SE SE	S.	3
Field Amlysis													
sisyland del													
View objected	,	-	5	5	5	5	9	9	9	2	2	2	2
113	,	• •	2 9	2 !	9 !	2 !		! !	! \$	9	9	9	5
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	5	2	2	2 :
1.1-Dichloroethane	8	¥	2	2	2	2	2	2	9	2	2	2	2
Chloreform	100	300	2	0.19PC	0.490	0.210	2	2	0.120	2	0.12PC	2	2
1.2-Dichloroethane	-	•	2	2	2	2	2	2	2	2	2	2	2
1.1.1-Trichlomethane	200	200	2	2	2	2	2	2	2	2	2	2	2
Carbon terrachloride	·	•	9	£	2	æ	2	2	2	2	2	2	2
Trichlomethere			188	1180	130	2	20C	210	7.60	4.6	4.8FC	2	2
Tet rachiotoethene	4	띺	8.0	1,3PC	0.540	0.570	1.00	0.77C	0.94C	2	0.36PC	2	2
All INCTS ADS/)													
MW - Manitorine Well			<b>126</b>	RADIAN = Radian Comoration. Secremento	Corporation.	Secramento		ND = Nothing	. Nothing detected				
				*	Caronie Environmental Services	ed Services		B - Corpoun	<ul> <li>Compound detected in Laboratory blank - not edited</li> </ul>	Laboratory b	Lark - not ed	ited	
			•	CAC Dadies	2 lenianient	To section	O Distance	C = Analysi	Amalysis confirmed in second column analysi	uloo broom a	m analysis		
			•	ı		Towns of the last			Or - Identity made als confirmed	and a country and			



SIMMER OF COMPONY DETECTED ANNYTES IN HONTIGRING WELLS FROM 1981 TO 1988, MACLELAN APE

	SHOO	U.S.EPA				3	IL NUMBER						
Pacameter	Act ion Level		_	<b>M</b> +1023	<b>M</b> +1023		M-1023	M4-1024	₩ 102¢	<b>16</b> 1024	₩-1024	MF-1024	<b>№</b> -1024
Manitoring Zone			SHALLON	SHALON	SEWLICH	SPACION	SHALON	MEDIE	MEDIE	ADDLE.	MODE	MEDIE	MEDIE
Date Sampled			04/15/87	08/11/80	10/22/87	01/13/88	01/13/88	11/04/86	01/19/87	01/19/87	04/15/87	04/15/87	08/11/80
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	PADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			04/16/87	08/13/87	10/28/87	01/14/88	01/14/88	11/06/86	01/26/87	01/26/87	04/16/87	04/16/87	08/13/87
4			SAC	SK	SS	Sec	S	SK	S	3	SEC	3	35
Field Amplysis													
Lab Analysis						á	9		ž	<b>8</b>	4	9	
Viryl chloride	2	-	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	•	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	Æ	2	2	2	2	2	2	2	2	2	2	2
Chloreform	901	100	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethene	1	5	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlomethere	200	300	9	2	2	5	2	2	2	2	9	2	2
Carbon tetrachloride	5	•	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	٠,	٠,	2	2	2	2	2	2	2	2	9	2	2
Tet rachloroethere	4	Ħ	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1 MA = Manitoring Well			**	RADIAN = Radian Corporation, Secremento	Corporation,	Secremento		D - Nothing detected	detected				
LDA * First laboratory deplicate analysis LDB * Second laboratory deplicate analysis	uplicate an Anjicate a	alysis palveis	Ö	C = Radian	Analytical S	Services, Seci	ramento	E - Not esta	blished				



SIMMER OF COMPALY DETECTED ANALYTES IN MONTORING WELLS FROM 1981 TO 1988, MOJELAN APB

	DOTES U.S	ته دد ا	M4-1024	M4-1024	M#-1025	3H	ELL NIMBER	<b>14-1</b> 025	<b>F4</b> -1025	<b>14-</b> 1025	<b>H</b> +1026	M4-1026	M-1036
Parameter	Level	¥											1
Manitoring Zone			MEDIE	MODE	880	200	63	4330	4	2220	SHALOW	SHWICH	SHALOW
Date Sampled			10/15/87	01/12/88	11/03/86	01/19/87	04/15/87	08/11/80	10/15/87	01/12/88	11/05/86	01/14/87	04/17/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/18/87	01/13/88	11/06/86	01/26/87	04/16/87	08/13/87	10/18/87	01/13/88	11/11/86	01/20/87	04/21/87
विष			Sec	Sec	3	3	Sec	SKC	SKC	3	S	3	9
Field Analysis													
Lab Analysis												;	
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	,	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichlaroethane	20	¥	2	2	2	2	2	2	2	2	2	9	2
Chloroform	100	8	9	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	-	S	2	2	2	2	2	2	2	2	9	2	2
1,1,1-Trichloroethane	300	8	2	2	2	2	2	2	2	2	2	Ş	2
Carbon tetrachloride	'n	'n	2	2	9	2	2	9	2	2	2	2	2
Trichloroethere	٠,	5	2	2	2	2	2	2	2	2	2	2	2
Tet rachlowethere	4	7	2	2	2	2	2	2	2	Q	Q	Q	Q
ALL UNITS ARE UR/1													
Mu = Monitoring Well			Ż	RADIAN = Radian Corporation, Secremento	Corporation,	Secremento		ND = Nothing detacted	detacted				
			75	1	S. land melant	Samuel Const.		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1000				

ND = Nothing detacted NE = Not established

RADIAN = Radian Corporation, Secramento SAC = Radian Analytical Services, Secramento



SHAWEY OF COMPILEY DETECTED ANALYTES IN HOUTHOUTC WELLS FROM 1981 TO 1988, MOLELLAN AFB

DOBS U.S Action Pri Parameter Level P	Action Level	E E	M-1026	M#-1026	M-1026	M-1026	WELL NAMER WH-1026	<b>H</b> +1027	M+1027	M4-1027	<b>1027</b>	M4-1027	N4-1027
Menitoring Zone Date Sampled Sampled By Date Analyzed Lab Field Analyzis			SHALLON 08/05/87 RADIAN 08/07/87 SAC	SHALION 10/14/87 RADIAN 10/19/87 SAC LDA	SWILGH 10/14/87 10/18/87 SAC LIB	SHALICH OL/15/88 RADIZAN OL/18/88 SAC	SHALICH 01/15/88 RADIAN 01/18/88 SAC LIJB	HUDILE 11/25/86 RADIAN 12/02/86 SAC	MUTILE 01/14/87 RADIAN 01/20/87 SAC LDA	MITGLE 01/14/87 RADIAN 01/20/87 SAC LDB	MEDILE 04/17/87 RADIAN 04/22/87 SAC	MUDILE 08/05/87 RADIAN 08/07/87 SAC	MEDIE 10/14/87 RADIAN 10/16/87 SAC
Vuyl chloride	2		2	2 9	2 9	2 9	99	2 2	2 2	22	22	22	2 2
1,1-Dichloroethere	9	,	2 !	2 9	2 9	2 5	9 9	2	2	2	2	2	2
1,1-Dichloroethave	8	<u>.</u>	<b>9</b> !	5 ;	2 9	2 9	9 9	9	9 😖	2	2	2	2
Chioroform	90	<u>8</u>	2	2 !	⊋ 9	2 5	2 9	2 5	9	2	2	2	2
1,2-Dichloroethane	-	'n	2	2	2	2 !	2 9	2 5	9	9	9	2	2
1,1,1-Trichlorcethane	<b>0</b> 2	200 200	2	2	2	2 :	⊋ :	2 9	2 9	2 5	9 9	£	2
Carbon tetrachloride	s	s	2	2	2	2	2 !	2 9	2 9	9 5	9 5	9	9
Trichlorvethere	'n	s	2	2	2	2	2	2 !	9 9	2 5	2 9	9	2
Tetrachloroethene	4	¥	2	2	2	2	2	2	2	2	5	2	,
ALL INITS ARE ug/1 M = Minitoring Well M = First laboratory deplicate analysis LIB = Secont laboratory deplicate analysis	hplicate a	slysts salysts		RADIAN = Radian Comporation, Secramento SAC = Radian Analytical Services, Sacramento	n Cosporation n Analytical	n, Secramento Services, Sa	Officer	ND == Nocthing NE == Noc est	<ul><li>Nothing detected</li><li>Not established</li></ul>				



SIMMER OF COMPARY DETECTED ANALYTES IN MONTORING WELLS FROM 1981 TO 1988, MICLELAN APE

H4-1028	DOPS U.S	20085	U.S.EPA					IL NUMBER						
Color   Colo	Parameter		Primary M.L.		MH-1028	M-1028	M+1028	M4-1028	M4-1029	<b>₩</b> 1029	₩+1029	<b>M</b> +1029	M+1029	<b>K</b> +1029
No.   No.	Mariana Jana			Nation 6	959	1000	662	669	SHATCH	SENION	SPALIGN	SHALOW	SWITCH	SHILOW
NOTING   Color   Col	ALL STREET			1	1 5	100	207.707	00/36/00	70/11/10	11/11/06	39/11/11	(8/00/10	01 /08/87	04/20/87
No.   No.	Date Sampled			01/17/88 01/17/88	/8/0/90	10/14/9/	10/ T#101	8/01/10	00/11/17	20/11/11	2011/11	0/00/10		1000
O1/18/88         08/13/87         10/16/87         01/18/88         11/19/86         11/19/86         11/19/86         11/19/86         01/13/87         O1/13/87         SAC         SAC <th< td=""><td>Sampled By</td><td></td><td></td><td>RADIAN</td><td>RADIAN</td><td>RADIAN</td><td>RADIAN</td><td>RADIAN</td><td>RADIAN</td><td>RADIAN</td><td>KADIAN</td><td>KADIAN</td><td>WOLVE OF</td><td>KACIAN</td></th<>	Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	KADIAN	KADIAN	WOLVE OF	KACIAN
SAC         SAC <td>Dare Analyzed</td> <td></td> <td></td> <td>01/18/88</td> <td>08/13/87</td> <td>10/16/87</td> <td>11/09/87</td> <td>01/18/88</td> <td>11/19/86</td> <td>11/19/86</td> <td>11/19/86</td> <td>01/13/87</td> <td>01/13/87</td> <td>05/01/8/</td>	Dare Analyzed			01/18/88	08/13/87	10/16/87	11/09/87	01/18/88	11/19/86	11/19/86	11/19/86	01/13/87	01/13/87	05/01/8/
NO	वन			SwC	S	SAC	8	95	S	S	<b>3</b> 5	S	3	S
NO	Field Analysis								é	Æ	FDB	£	<b>108</b>	
NO	Lab Aralysis								ş	<b>8</b>				
NO	View halonide	,	1	S	9	2	2	2	2	2	2	2	2	2
NO	1-Dichlomethere	1 40	. ~	9	9	9	2	2	0.170	0.190	0.190	2	2	2
NO	1-Dichlomethane	۶ د	. 12	9	9	9	9	2	28.9	6.70	6.3C	£.7C	5.30	9.4C
NO	h conform	2	5	2	2	2	2	2	2	2	2	2	2	2
NO	2-Dichlymethane		·	2	9	2	2	2	2	2	2	2	2	2
NO	1 1-Trichlomethane	200	300	2	2	2	2	2	2	2	2	2	2	2
NO NO NO NO NO NO NO NO NO NO NO NO NO N	arton retractionide		<u>ب</u>	2	2	2	2	2	2	2	£	2	2	2
NO NO NO NO NO NO NO NO NO NO NO NO NO N	richlomerhare	Š	۰.	9	2	2	2	2	1.10	1.20	1.10	0.78C	0.850	3.00
RADIAN = Radian Corporation, Secramento ND = Norbing detected CES = Canonie Environmental Services C = Analysia continued SAC = Radian Analytical Services, Secramento NE = Not estabilished	let rachioroethene	4	Ä	2	2	2	2	2	Q	2	2	2	2	2
RADIAN = Radian Corporation, Secramento NO = Norburg detected  QES = Carrule Environmental Services C = Analysis confirmed  SAC = Radian Analytical Services, Secramento NE = Not established	LL UNITS ARE ug/1													
TB = Second Laboration of the first second Laboration of the Logical Second Laboration of the Logic	W = Manitoring Well FDA = First field duplic FDB = Second field dupli FDA = First laboratory d	cate analysic loate analysi holicate ana	s si siysis	<b>ፈ</b> ዐላ	1 1 1 2	n Corporation, le Ervicoment n Analytical S	, Sacramento tal Services Services, Sacr	ramento	NO = Noching C = Analysis NE = Noc esta	_ 18	n secard colum	m arelysis		
	LIB = Second Laboratory	deplicate a	ralysis											

B-88



SIMMEY OF COMPANY DETECTED ANALYTES IN MANTORING WELLS FROM 1981 TO 1988, M-CLELLAN AFB

			į										
	DORS Action	DORE U.S.EPA Action Primary	M4-1029	M-1029	MA-1029	H-1029	MELL NUMBER MA-1029	M-1030	MA-1030	M-1030	M-1030	M-1030	M4-1030
Parameter	Level	랓								2 30000		MITTE	MEDIE
Monitoring Zone Date Sampled Sampled By Date Analyzed Lab Field Analyzed			SHAL ON 08/07/87 PADIN 08/13/87 SAC	SHALION 10/12/87 RADIAN 10/13/87 SAC FDA	SHALLON 10/12/87 RADIAN 10/13/87 SAC FUB	SHALICH 10/12/87 RADIAN 10/13/87 SAC FDB	SHALOW 01/18/88 RADIAN 01/20/88 SAC	MILLIE 11/11/86 RADIAN 11/19/86 SAC	MULLE 01/06/87 RADIAN 01/13/87 SAC	04/29/87 RADIAN 05/01/87 SAC	08/07/87 RADIAN 08/13/87 SAC	10/12/87 RADIAN 10/14/87 SAC	01/17/88 RADIAN 01/20/88 SAC
Lab Analysis					Ē	971		-			•	5	2
Viryl chloride 1,1-Dichloroctiere 1,1-Dichloroctiere Chlorofom 1,2-Dichloroctiere 1,1,1-Tichloroctiere Carba retrachloride Trichloroctiere Ter rachloroctiere	200 100 200 200 200 4	1 / H H S S S S S S S S S S S S S S S S S	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	8 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	60 2.20 2.20 0.710 NO NO NO NO NO NO NO NO NO NO NO NO NO	8 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	22222222	55555555	22222222	2 2 2 2 2 2 2 2 2	22222222	2922222

ALL UNITS ARE ug/1

144 = Munitoring Well

150A = First field duplicate aralysis

151B = Second field duplicate aralysis

110A = First laboratory duplicate aralysis

111B = Second laboratory duplicate aralysis

RADIAN = Radian Corporation, Secramento SAC = Radian Amalytical Services, Secramento

Mothing detected
 Analysis confirmed in second column analysis
 Not established



SIMMER OF COMPOREY DETECTED ANALYTES IN MONTHOUNC WELLS FROM 1961 TO 1988, MICLELLAN API

DESP   DESP   DESP   DESP   DESP   DESP   MITTLE   MITT	DORS U.S	DOBS	A P	ML-1031	M4-1031	M4-1031	M-103	WELL NUMBER	M-1031	M-1031	M+1032	M4-1032	M4-1032	M4-1032
11/21/66   01/06/87   04/29/87   06/10/87   10/12/67	Parameter	Level	ğ											
11/18/96   01/08/87   04/29/87   04/29/87   10/12/87   10/12/87   01/17/98   11/19/96   01/13/67   01/13/67   01/13/87	Monitoring Zone			2330	2330	aaa	223	ã	833	830	MILE	MIDIE	MIDLE	MILLE
11/21/66   01/13/87   05/01/87   06/113/87   10/13/87	Date Samled			11/18/86	01/08/87	04/29/87	08/10/87	10/12/87	10/12/87	01/11/88	11/19/86	01/13/67	05/01/87	08/04/87
11/21/66   01/13/87   05/01/87   06/14/87   10/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68   11/22/66   01/13/87   01/20/68	Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
SkC   SkC	Dare Analyzed			11/21/86	01/13/87	05/01/87	08/14/87	10/13/87	10/13/87	01/20/88	11/22/86	01/19/87	05/05/87	08/07/87
State   Stat	qe]			S	SKC	SK	35	3	38	S	SK	3	SAC	3
sere         2         1         NO         NO<	Field Aralysis Lab Aralysis							¥2¥	<b>873</b>					
size         6         7         ND         ND<	Viryl chloride	2	1	2	2	2	2	2	2	2	5	2	2	2
setlace         20         1E         ND         ND <t< td=""><td>1.1-Dichloroethere</td><td>•</td><td>7</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td><td>2</td></t<>	1.1-Dichloroethere	•	7	2	2	2	2	2	2	2	2	2	2	2
100   100	1.1-Dichloroethare	20	ĕ	2	2	2	2	2	2	2	2	2	2	2
Decretare   1   5   ND   ND   ND   ND   ND   ND   ND	Chloroform	100	8	2	2	2	2	2	2	2	2	2	9	2
200   NO	1.2-Dichloroethane	-	'n	2	2	2	2	2	2	2	2	2	2	2
5 NO NO NO NO NO NO NO NO NO NO NO NO NO	1.1.1-Trichloroethane	200	08	2	2	2	2	2	2	2	2	2	2	2
S   NO	Carbon tetrachloride	٠,	٠	2	2	2	2	2	9	2	2	2	2	2
RADIAN = Radian Corporation, Secremento NO = Northing detected SAC = Radian Aralytical Services, Sacramento NE = Nor established	Trichloroethere	s	s	2	2	2	2	2	2	2	2	2	2	2
RADIAN = Radian Corporation, Secremento ND = SAC = Radian Aralytical Services, Secremento NE =	Tet rachloroethere	7	æ	2	2	2	2	2	2	2	2	2	2	2
RADIAN = Kadian (opporation, Secremento NO = SAC = Radian Aralytical Services, Secremento NE = 5	ALL UNITS ARE UE/1													
M. * Nation Mallytical Services, Satismento inc.	MW = Manitoring Well			2 6	VOIAN = Kadian	Corporation,	Secremento		N = Nothing	detected				
FIB = Second file of deplicate enalysis	FIA * First field deplic	sate analysi	<b>.</b>	ħ	Kadia	A Malytical S	services, sac	Camerico	NC = NOC est	0.00				
•	FUB - Second field dapl:	icate analys	มี											



SIMMER OF COMPALY DEDICTED ANALYTISS IN MONTHQUIRG WELLS FROM 1981 TO 1988, MACLELLAN APB

	SHOO	U.S.E	EPA				TL NUMBER						
Parameter	Act ion Level	F X	ky M4-1032	<b>₩</b> -1032	MH-1033	MV-1033	M4-1033	M4-1033	M+1033	M-1033	M4-1033	M+1034	₩-1034
Monitoring Zone	-		MEDICE	MEDILE	MOTMES	SHALOW	SHALON	SEWLOW	SHVLON	SHALLOW	MOTANS	MODE	<b>MOD</b> E.
Date Sampled			10/09/87	01/14/88	11/12/86	01/08/87	04/28/87	08/10/80	10/13/87	01/12/88	01/12/88	11/12/86	01/08/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	PADLAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			10/12/87	01/15/88	11/20/86	01/13/87	04/29/87	08/14/80	10/14/87	01/13/88	01/13/88	11/20/86	01/13/87
qeT			Sec	8	Sec	S	S	35	S	SK	Sec	Sec	S
Field Aralysis Lab Aralysis										<b>Š</b>	99		
Viry'l chloride	2	-	2	2	2	2	2	2	2	5	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	20	¥	2	2	2	2	2	2	2	2	2	2	2
Chloroform	100	8	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	-	s	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichloroethare	200	800	2	2	2	2	2	2	2	Ş	2	2	2
Carbon tetrachloride	5	\$	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	5	5	2	2	2	2	2	2	2	2	2	2	2
Tetrachloroethere	4	ñ	2	2	2	2	2	£	2	2	2	2	2
ALL UNITS ARE ug/1													
M = Monitoring Well			2	RADIAN = Radian Corporation, Secramento	n Comporation	, Secramento		ND = Northing detected	detected				
LDA = First laboratory duplicate amilysis	tplicate a	alysis	S	AC = Radian	Analytical	Services, Seci	ranento	NE = Not est.	ablished				
IJB = Second Laboratory	denlicate a	sissis		•									



SIMMRY OF COMPONEY DETECTED ANALYTES IN MONTROING WELLS FROM 1981 TO 1988, MACELLAN AFB

	S.U. SHOO	U.S.EPA					II. NIMBER						
Parameter	Action	tion Primary MA-	M-1034	M4-1034	M#-1034	M4-1034	M+1034	M-1034	MH-1035	M+1035	MJ-1035	M-1035	N4-1035
Manitoring Zone			MEDGLE	MIDLE	MEDIE	MEDIE	MODE	KEELE	633	83	250	830	690
Date Sampled			04/28/87	08/10/87	10/13/87	10/13/87	01/12/88	01/12/88	11/25/86	01/08/87	04/28/87	08/10/87	10/13/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			04/30/87	08/14/87	10/14/87	10/14/87	01/13/88	01/13/88	12/02/86	01/13/87	04/29/87	08/14/87	10/14/87
qe'l			Sec	SAC	SS	Se	Se	SAC	Sec	SE	S	SKC	Sec
Field Analysis							ě	875					
Lab Analysis					<b>Š</b>	<b>9</b> 01							
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	S	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	8	¥	2	2	2	2	2	2	2	2	2	2	2
Chloraform	001	901	2	2	2	2	2	2	2	2	2	2	2
1,2-Dichloroethane	1	٠	2	2	2	<del>2</del>	2	2	2	2	2	2	2
1.1,1-Trichloroethane	200	200	2	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	'n	2	2	₽	2	2	2	2	2	2	2	2	2
Trichloroethere	'n	S	2	2	2	2	2	2	2	2	2	2	2
Tetrachiomethere	4	Ä	2	<u>Q</u>	0.20C	2	2	2	2	2	2	2	2
ALL UNITES ARE UR/1													
MW = Monitoring Well			2	VOLAN = Radian	Corporation,	Sacramento	-	NO - Nothing	detected				
FDA = First field duplic	ate analysi	•7	ð	SAC = Radian Analytical Services, Sacrament	Analytical S	eryloes, Sacr	amento (	C = Analysis	- Analysis confirmed in second column analysis	a second colun	m analysis		

M4 = Menteoring Mell FDA = First field deplicate analysis FDB = Second field deplicate analysis LDA = First Laboratory deplicate analysis LDB = Second Laboratory deplicate analysis

ND = Nothing detected
C = Analysis confirmed in second colum analysis
NE = Not established



SIMMER OF COMMULY DETECTED ANALYTES IN MONTHQUIC WELLS FROM 1981 TO 1988, MACLELLAN APE

	DONS Action	U.S.EPA Primery	M+1035	M-1036	M+1036	M4-1036	ELL NUMBER	M4-1036	M4-1036	<b>K</b> 4-1036	MP-1036	MJ-1036	M+1037
Parameter	Level	Ĕ											
Monitoring Zone			OBER O	SHWILDW	SHALLOW	SHALLON	SHALLON	NOTMIS	SHALLOW	SHALON	SHALON	SHATON	SHALLOW
Date Sampled			01/12/88	11/19/86	01/16/87	01/16/87	04/23/87	/8/90/80	10/21/87	10/21/87	01/14/88	01/17/88	10/31/86
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			01/13/88	11/22/86	01/21/87	01/21/87	04/24/87	08/10/80	10/23/87	10/23/87	01/15/88	01/15/88	11/03/86
କ୍ଷ			SAC	SAC	SAC	35	SAC	Sec	SKC	Sec	SAC	SAC	S
Field Aralysis									Ą	FUS	FQ.	F108	
Lab Analysis					Ą	8C1							
Viryl chloride	2		2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethene	9	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethane	R	¥	5	윤	2	2	2	2	2	2	2	2	9
Quloraform	100	100	2	0.15	2	2	2	2	0.120	0.110	2	2	2
1,2-Dichloroethane		2	2	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlorcethane	<b>8</b>	800	2	2	2	2	2	2	2	2	2	2	æ
Carbon tetrachloride	\$	٠	2	9	2	2	2	2	2	2	2	2	2
Trichloroethere	S	2	£	98.0	0.630	0.79	1.20	2	0.510	0.55C	0.32PC	0.25PC	2
Tet rachloroethere	4	씶	Q	9	2	2	2	2	2	2	2	2	2

RADIAN = Radian Corporation, Sacramento SAC = Radian Analytical Services, Sacramento

ND = Nothing detected
C = Aralysis confirmed in second column analysis
P or RC = Identity previously confirmed
NE = Not established

ALL UNITS ARE ug/1

M = Menteoring Well

FDA = First field deplicate analysis

FDB = Second field deplicate analysis

FDB = Second taboratory deplicate analysis

FDB = Second laboratory deplicate analysis



SLIMMEY OF COMPLEY DETECTED ANALYTES IN MONTORING WELLS FROM 1981 TO 1988, MCCLELLAN AFB

Action Primary Parameter Level ML		5										
	Primar AT	y M4-1037	M4-1037	MJ-1037		M-1037	M-1038	M4-1038	M-1038	MH-1038	M4-1038	M4-1038
Manitoring Zare		SHWLDW	SHWLOW	SHALLON	SHALOW	SHALLOW	MEDLE	MEDIE	MIDLE	MIDIE	MODE	MEDELE
Date Sampled		01/15/87	05/07/87	08/12/87	10/13/87	01/15/88	11/20/86	11/20/86	01/15/87	04/30/87	08/04/87	10/13/87
Sampled By		RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed		01/21/87	05/11/87	08/18/81	10/14/87	01/18/88	11/24/86	11/24/86	01/21/87	05/04/87	08/01/87	10/16/87
qe-1		98	3	SK	38	SAC	SAC	SS	8	SAC SAC	S	SAC
Field Analysis Lab Analysis							Ą	<b>8</b> 71	i			
Virw! chloride 2	-	2	2	2	2	2	2	2	2	£	2	2
1,1-Dichtoroethene 6	7	5	2	2	2	2	2	9	2	2	2	2
1,1-Dichloroethane 20	2	£	€	£	2	2	0.19	0.17	2	2	2	2
Chloraform 100	100	2	2	2	2	2	2	2	Ð	2	2	2
ethane	\$	Ð	2	2	2	2	2	2	2	2	2	2
1,1,1-Trichlorethme 200	200	æ	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride 5	5	2	2	2	2	2	2	2	2	æ	2	2
Trichloroethene 5	5	2	9	2	2	2	1.4	2	2	2	2	2
Tet rachloroethene 4	¥	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE UR/1												
MW = Monitoring Well			ADIAN = Radian	Corporat ion,	Sacramento	_	ND = Nothing detected	detected				
IDA = First laboratory duplicate analysis	alysis		SAC = Radian Analytical Services, Secramento	Analytical 5	ervices, Sac.	_	NE - Not esta	abi i shed				
IB = Second Laboratory duplicate at	nalvsis											



SIMMRY OF COMPLY DETECTED ANALYTES IN HOUTTORING MELLS FROM 1981 TO 1988, MCCLELLAN AFB

	DOHS	U.S.EPA					ELL NIMBER						
Parameter	Act lon Level	Primacy MCL	M-1038	₩-1039	M-1039	M-1039	M-1039	M-1039	<b>№</b> -1039	M-1039	<b>№</b> -1040	M-1040	M4-1040
Monitoring Zone			MODE	2230	GEE	DEEP	DEEP	DEEP	DEEP	0330	Deep	DEEP.	6690
Date Sampled			01/15/88	11/20/86	01/15/87	01/15/87	04/30/87	08/03/87	10/13/87	01/27/88	11/17/86	01/21/87	05/05/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			01/18/88	11/24/86	01/21/87	01/13/87	05/04/87	08/06/87	10/16/87	01/29/88	11/21/86	01/27/87	05/06/87
(Pap			Sec	Sk	S	9	SAC	3	9	3	SAC	CAS	3
Field Aralysis			ı	l !	)	l l	ì	)	l I	l l	}	}	1
Lab Analysis					¥Ţ]	89							
Viryl chloride	2	1	2	2	2	2	2	2	2	2	2	2	2
1.1-Dichloroethene	ç	1	2	2	2	2	2	2	2	0.750	2	2	2
1.1-Dichloroethare	8	Ή	Đ.	2	2	2	2	2	2	2	2	2	S
Quioroform	100	100	2	2	2	2	2	2	2	2	2	2	2
1.2-Dichlorvethane	п	٠	2	2	2	2	2	2	2	2	2	9	9
1,1,1-Trichlomethane	200	90	£	2	2	2	2	2	2	2	2	2	2
Carbon tetrachloride	ς.	5	2	2	2	2	2	2	2	2	2	2	2
Trichloroethene	5	5	€	2	2	¥	2	2	2	2	2	2	2
Tet rachloroethene	7	¥	2	2	2	2	2	2	2	2	2	2	2
ALL UNITS ARE ug/1			70	Antware Budin	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			The Line					
IDA = First laboratory diplicate analysis IIB = Second laboratory diplicate analysis	uplicate an Aplicate an	alysis	2 29	SAC = Radian Analytical Services, Secrement	Analytical	Services, Saca	0	C = Analysis	= Avalysis confirmed in second column analysis = Mor pershilded	n second colun	m analysis		
(10000000000000000000000000000000000000		200					•						



SIMMEY OF COMPANY DETECTED ANALYTES IN MONTRAING WELLS FROM 1981 TO 1988, MACLELLAN APB

DOFS U.S. Action Prin	DOHS Action	U.S.EPA Primacy	DORS U.S.EPA Action Primary M4-1040	<b>MM-</b> 1040	M-1040	M-1041	WELL NUMBER MA-1041	M-1041	<b>M</b> -1041	M-1041	M-1041	M-1041	<b>M-</b> 1041
Tanalian to		!				į							
			Ę	£	ę.	CHAILC	SHALL CL	MOTMES	SHALLON	SHALLOW	SHALLOW	SHALON	SHALION
Monitoring Care			1	Ì					100,007,00	106,007	09/06/87	10/14/87	10/14/87
Date Sampled			07/27/87	10/20/87	01/20/88	11/14/86	11/14/86	01/22/8/	01/27/01	0000		Distance of	Depter
Samilar By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	KADIAN	KALLAN	KALUMA 10100
Constitution of the consti			CR128(15)	10/23/87	01/21/88	11/20/86	11/20/86	01/28/87	01/28/87	05/11/87	08/10/87	10/18/8/	10/18/8/
Late A suyan			, J	) ) (8)	Sec	280	SAC	SKC	SAC	Se	S.	S	SK SK
Field Amalysis			2	ì	1	¥Q.	904	FDA	3 <u>1</u>			!	į
Lab Analysis												9	5
				4	9	5	Ş	9	2	2	2	2	2
Virily chloride	7	-1	€	2	5	3		! !	9	9	S	S	S
1.1-Dichloroethene	Đ	7	2	2	2	2	2	2	2 !	2 9	9 9	2	2
1 1-Dishlomerhans	20	ų.	9	2	2	2	2	2	2	2	2	2 !	2 9
	5	5	Ş	S	2	2	2	2	2	2	2	2	2 :
1 2 K - 1 - 1 - 1 - 1 - 1	3 .	3,,		9 5	2	9	2	2	2	2	2	2	2
1,2-Durn oroethars	<b>-</b>	0	9 !	2 9	2 9	2 9	: 5	2	£	2	2	2	2
1,1.1-Trichloroethane	00Z	300	⊋	2	2 !	≥ 9	9	2	£	£	2	2	2
Carbon tetrachloride	^	~	Ð	2	2	2	2	2 !	2 9	2 5	9 5	9 5	£
Trichloroethere	٠,	2	2	2	2	29	1.0	2	2 !	2 :	2 9	9	9
Tetrachlomethere	7	ij	2	2	2	2	2	2	2	2	2	2	
ALL UNITS ARE ug/1								:					
MW = Manttoring Well			2	VDIAN = Radia	RADIAN = Radian Corporation, Sacramento	i, Sacramento		NO = Nothing	detected		in last		
FIA = First field duplicate arelysis	ate amplys	ş	Ö1	kC = Radia	= Radian Analytical Services, Sacramento	Services, Sax	remento	C = Aralysi	= Analysis confirmed in securi column analysis	n securi com	III & MALLYSTS		
FUB = Second field duplicate analysis	cate analys	sis						NE = NOC est	DEL LENGT				

FB = Secord field duplicate analysis LB = First laboratory duplicate analysis LB = Secord laboratory duplicate analysis



SIMMER OF COMMILY DETECTED AMENTES IN MINITURING WELLS FROM 1981 TO 1988, MALELLAN APB

	DORS	U.S. EPA				3	IL NIMBER						
Parameter	Action Level		Primary M4-1041 MCL	M4-1041	M4-1042	M-1042	M-1042	M-1042	M4-1042	MF-1042	<b>MF</b> -1043	MF-1043	MH-1043
Manitoring Zone			SHALLOW	SHALOU	MEDILE	MIDGE	MEDIE	MITTER	MEDILE	MIDIE	2530	<b></b>	<b>249</b> 0
Date Samled			10/14/87	01/18/88	11/21/86	01/22/87	05/06/87	08/06/87	10/14/87	01/18/88	11/21/86	01/22/87	05/06/87
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	RADIAN
Date Analyzed			11/09/87	01/19/88	11/25/86	01/28/87	05/11/87	08/10/87	10/18/87	01/19/88	11/25/86	01/28/87	05/11/87
4			8	SK.	3	35	SAC	SAC	S	SAC	SAC	SAC	Sec
Field Analysis													
Lab Analysis			rej.										Š
Viryl chloride	2	7	2	2	2	2	2	2	2	2	2	2	2
1,1-Dichloroethere	9	7	2	2	2	2	9	£	2	2	2	2	2
1,1-Dichloroethane	50	¥	2	2	2	2	2	2	2	2	2	2	2
Onlorenform	100	902	£	2	2	2	2	2	2	2	2	2	2
1,2-Dichlomethane	-	S	2	2	2	2	2	2	2	2	₽	2	2
1,1,1-Trichlomethane	800	007	2	2	2	2	2	2	2	2	2	2	£
Carbon tetrachloride	ş	٠	2	2	2	2	2	2	2	2	2	2	2
Trichloroethere	٠,	Ś	2	2	0.41	2	2	2	2	2	9	2	2
Tet rachloroethere	4	題	2	2	2	2	2	<del>2</del>	2	2	2	2	2
ALL UNITS ARE ug/1			γď	OTAN = Radia	Comparion	Secremento		D = Nothing	detected				
LDA = First laboratory deplicate analysis	uplicate an	sisyle	200	S = Canon	CES = Carrie Environmental Services	al Services		NE = Not established	bark i ld				
			73	F Redia	n Aranytican	MINTES, ONL							

# RADIAN

SIMMRY OF COMPINEY DETECTED AWLYTES IN MONTHOLING WELLS FROM 1981 TO 1988, HICLELLAN APB

	DORS	U.S.EPA				냋	IL NABER	
Parameter	•	Primacy	/ M4-1043	M-1043	MF-1043	M4-1043	MA-1043	
Manitoring Zone			252	DEEP	AG C	â	433	
Date Sampled			05/06/87	08/06/87	10/14/87	01/18/88	01/18/88	
Sampled By			RADIAN	RADIAN	RADIAN	RADIAN	RADIAN	
Date Analyzed			05/11/87	08/10/82	10/18/87	01/19/88	01/19/88	
qel			SS	SAC	Sec	S	SK	
Field Analysis								
Lab Analysis			<b>8</b> 01			4	<b>8</b> 1	
Viryl chloride	2	1	2	2	2	2	2	
1,1-Dichloroethene	9	7	2	2	2	2	2	
1,1-Dichloroethane	20	æ	2	2	2	2	2	
Chloroform	100	9	2	2	2	2	2	
1,2-Dichloroethane	-	\$	2	2	2	2	2	
1,1,1-Trichloroethane	200	200	2	2	2	2	2	
Carton tetrachloride	2	2	2	2	2	2	2	
Trichloroethere	5	5	2	2	2	2	2	
Tet rachloroethene	-3	¥	2	2	2	2	2	
ALL UNITS ARE UB/1								
MW = Manitoring Well			₹	DIAN = Radian	Corporation,	RADIAN = Radian Corporation, Sacramento		ND = Nothing detected
UDA = First laboratory da	uplicate an	sizyler	Ħ	C = Radiar	1 Analytical 5	ervices, Saci	ramento	NE = Not established
LIB = Second Laboratory duplicate analysis	diplicate a	malysis						

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### RADIAN

### APPENDIX C

Summary of Volatile Organic Compounds Detected in Base Production Wells

TABLE C-1. SUMMARY OF VOLATILE ORGANIC COMPOUND CONCENTRATIONS DETECTED IN BASE PRODUCTION WELLS

化物质化物质质质质质质质质质质质质质质质质质质质质质质质质质质质质质质质质质质	神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神神	**	(7/5n) Spunodwo)		Compounds (usesses		6 14 14 16 16 16 16 17 18 18 18 18 18 18 18	
Monitoring	DOMS Action Levels: U.S. EPA PMCL:	1 <u>CE</u> 5	Carbon <u>Tetrachloride</u> 5 5	<u>Chloroform</u> 100 100	1,2-DCE 16 NE	1,1,1-TCA 200 NE	1.1-006	1.2-0CA 1 5
AREA A AND AD	1 21							
9W-1 11/79 - Well taken out of 01/80 03/80 05/80 12/80 12/81	••-	e to con' 78 53 53 0 716 100 1,500 03/80 du	service due to contamination. 78 .5-8.7 230 to 716 17-34 100 1,500 service on 03/80 due to contamination.	. 24	5 E	4.2		ñ
84-2 11/79 07/80 08/80 12/81 Well is curr	11/79 07/80 08/80 12/81 Well is currently out of service on	2.9 110 10 11/79 de	2.9 110 10 service on 11/79 due to contamination.	ė		0 10	271	

BN-11

08/79<sub>\*</sub> - Initial sampling. 12/81

Well is no longer on base property.

(Continued)

No purgeable halocarbons of interest detected during sampling. Trace (terminology used by USAF to quantify low levels of analytes).

Not established. E #

TABLE C-1. (Continued)

10 10 10 10 10 10 10 10 10 10	经存储的 经收益 医甲状腺素 医甲状腺原皮皮皮脂皮皮皮皮脂皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮皮	17 18 18 18 18 18	(1/5n) spunoduo)	COMDO	(1/bn) spunodwo)	16 66 66 66 66 66 66 66 66 66 66 66 66 6	10 M M M M M M M M M M M M M M M M M M M	# H H H H H H H H H H H H H H H H H H H
			Carbon					
		1CE	Tetrachloride	Chloroform	1.2-DCE	1-1-1-1CA	1,1-DCE	1.2-DCA
Monitoring	DOMS Action Levels:	~	•	100	91	200	•	-
Wells	U.S. EPA PMCL:	s	s	100	M	<b>3</b>	^	'n

AREA B AND ADJACENT ON-BASE AREAS (Continued)

	to 08/80 20		_
BW-12		08/80 05/81	07/81 12/81

35 27 54

∞

Well is currently out of service on 08/80 due to contamination.

# 8N-7

CIRCA 1956 - Well contaminated with unspecified hydrocarbons and phenols. CIRCA 1970 - Well abandoned (destroyed).

AREA 8 AND ADJACEN ON-BASE AREAS	
8W-13	
04/80	٥
08/80	72
12/81	
10/85	<0.5 0.8
11/85	<0.5
12/85	<0.5
01/86	<0.5
02/86	<0.5

0.7

No purgeable halocarbons of interest detected during sampling.

 $\star$  Trace (terminology used by USAF to quantify low levels of analytes).  $\star$  Not established. **E A** 

MCSEM1AN/071688/JKS

Carbon   Carbon   L2-DEE   L1-LICA   L1-DEE   L2-DEE   L2-			1		Comp	Compounds (ug/L)			
### Parties   5   5   100   16   200   6   1    ### DATE OF THE O			ICE	Carbon <u>Tetrachloride</u>	Chloroform	1.2-DCE	1,1,1-TCA	1,1-DCE	1.2-DCA
U.S. EPA PMCL;   5   5   100   NE   NE   7   5   5   5   5   100   NE   NE   7   5   5   5   5   5   5   5   5   5	Monitoring		5	ν.	100	16	200	•	-
(Continued)  (Cont	Wells	U.S. EPA PMCL:	\$	5	100	¥	N.	7	2
(Continued)  0.7 0.6  0.7 1.1  <0.5 1.3  <0.5(TR) 1.1  <0.5(TR) 1.1  <0.5(TR) 1.1  <0.5 1.3  <0.5 1.3  <0.5 1.3  <0.5 1.1  TR 1.5 2.1  TR 0.8 TR  1.4 7.8 1.3  1.2 6.0 0.8  1.5 6.8 1.0  2.3 3.3 0.7  **Mall taken out of service "due to bish levels of carbon tetrachloride."	AREA B AND A	ON-BAS	(Continued)						
0.7 0.6 0.7 1.1 40.5 1.0 1.3 40.5 (TR) 1.1 40.5 (TR) 1.1 40.5 1.3 40.5 1.3 40.5 1.3 40.5 1.3 40.5 1.1 40.5 1.1 40.5 1.1 40.5 1.2 40.5 2.1 41.0 5.5 41.0 5.5 41.0 5.5 41.0 6.8		inued)							
0.7 0.6  0.7 1.1  0.5 1.1  0.5 1.3  0.5(TR) 1.1  0.5 1.3  0.5 0.5  1.1  0.6  0.5 0.9  0.6  0.7  1.1  1.2 0.0  1.3  1.4 7.8 1.3  1.4 7.8 1.3  1.5 2.1  TR  1.4 7.8 1.3  1.5 6.8 1.0  2.3 3.3 0.7	03/86								
(0.5 1.1 (1.3 (0.5 1.2 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (1.3 (0.5 (0.5 (0.5 (0.5 (0.5 (0.5 (0.5 (0.5	04/86		2.0	9.0					
40.5 1.0 1.3 40.5 (TR) 1.3 40.5 (TR) 1.1 40.5 (TR) 1.1 40.5 6.0 0.6 40.5 6.0 0.6 40.5 6.0 0.8 40.5 6.0 0.8 40.6 6.0 0.8 40.7 8.10 40.7 8.10 40.8 1.	05/86		7.0	1.1					
<ul> <li>&lt;0.5   1.3  </li> <li>&lt;0.5(TR)   1.1  </li> <li>&lt;0.5   1.3  </li> <li>&lt;0.5   1.5  </li> <li>&lt;0.5   1.1  </li> <li>&lt;0.5   1.1  </li> <li>&lt;0.5   0.9  </li> <li>&lt;0.5   0.9  </li> <li>&lt;0.5  </li> <li>&lt;0.5  </li> <li>&lt;0.5  </li> <li>&lt;0.5  </li> <li>&lt;0.5  </li> <li>&lt;0.5  </li> <li>&lt;0.5  </li> <li>&lt;0.6  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.6  </li> <li>&lt;0.7  </li> <li>&lt;0.6  </li> <li>&lt;0.7  </li> <li>&lt;0.6  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.7  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.8  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;0.9  </li> <li>&lt;</li></ul>	98/90		<0.5	1.0	1.3				0.5
<ul> <li>40.5 1.3</li> <li>40.5 1.1</li> <li>40.5 1.1</li> <li>40.5 1.1</li> <li>40.5 0.9 0.6</li> <li>40.5 0.9 0.6</li> <li>40.5 0.9 0.6</li> <li>40.5 2.1</li> <li>40.5 2.1</li> <li>40.5 2.1</li> <li>41.4 7.8 1.3</li> <li>41.4 7.8 1.3</li> <li>41.0 5.5 1.3</li> <li>41.2 6.0 0.8</li> <li>41.0 5.5</li> <li>41.0 5.7</li> <li>41.1 5.2 5.3</li> <li>41.0 5.7</li> <li>41.1 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.3 5.3 5.7</li> <li>41.1 5.3 5.3 5.3 5.3 5.3 5.3 5.3 5.3 5.3 5.3</li></ul>	07/86		<0.5	1.3					
40.5(TR) 1.1 0.6 40.5 1.5 0.6 40.5 0.9 0.6 40.5 0.9 0.6 40.5 40.5 2.1 TR 1.5 2.1 TR 0.8 TR 1.4 7.8 1.3 1.0 5.5 4.0 0.8 1.5 6.8 1.0 2.3 3.3 0.7	08/86		<0.5	1.3					
40.5 1.5 0.6 40.5 1.1 40.5 6.9 0.6 40.5 6.0 40.5 6.0 40.5 6.0 40.5 6.0 40.5 7.8 1.3 40.6 6.8 1.0 40.7 6.8 1.0 40.7 6.8 1.0 40.7 6.8 1.0 40.1 of service "due to high levels of carbon tetrachloride."	98/60	₹	0.5(TR)	1.1					
40.5 0.9 0.6 40.5 40.5 40.5 40.5 40.5 1.1	10/86		<0.5	1.5	9.0				
<ul> <li>&lt;0.5</li> <li>&lt;0.5</li> <li>&lt;0.5</li> <li>&lt;0.5</li> <li>TR</li> <li>&lt;0.8</li> <li>TR</li> <li>&lt;0.8</li> <li>&lt;0.7</li> <li>&lt;0.8</li> <li>&lt;0.7</li> <li>&lt;0.7</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.7</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.7</li> <li>&lt;0.8</li> <li>&lt;0.9</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.8</li> <li>&lt;0.9</li> <li>&lt;0.9</li> <li>&lt;0.9</li> <li>&lt;0.9</li> <li>&lt;0.0</li> <li>&lt;0.</li></ul>	11/86		<0.5	1.1					
40.5 40.5 TR 1.5 2.1 TR 0.8 TR 1.3 1.0 5.5 1.2 6.0 0.8 1.5 6.8 1.0 2.3 3.3 0.7 ***	12/86		<0.5	6.0	9.0				
40.5  TR 1.5  2.1  TR 1.5  2.1  TR 0.8  TR 1.3  1.0  5.5  1.2  6.0  0.8  1.5  6.8  1.0  2.3  3.3  0.7  - Well taken out of service "due to high levels of carbon tetrachloride."	01/87		<0.5						
TR 1.5 2.1  TR 0.8 TR 1.4 7.8 1.3 1.0 5.5 1.2 6.0 0.8 1.5 6.8 1.0 2.3 3.3 0.7  - Well taken out of service "due to high levels of carbon tetrachloride."	02/87		<0.5						
TR 0.8 TR 1.3 1.4 7.8 1.3 1.0 5.5 1.0 5.5 1.0 5.5 1.0 5.5 1.0 2.3 3.3 0.7 2.3 3.3 0.7 2.3 3.3 0.7	03/87		<0.5		2.1				
o de la companya de l	04/87		<u>٦</u>	1.5	2.1		<b>*</b>		
o and and and and and and and and and and	05/87		¥.	0.8	Œ.				
o Lind Control of Cont	78/90		1.4	7.8	1.3				
o and control of the	07/87		1.0	5.5					
Tion control of the c	08/87		1.2	6.0	0.8				
o new or the control of the control	18/60		1.5	6.8	1.0				
	05/88		2.3	3.3	7.0				
	BU-17								
	12/81								
	05/85 - Vell		"due to high	levels of carbor	n tetrachloride	=.			

(Continued)

IR = Trace (terminology used by USAF to quantify low levels of analytes). WE = Not established, = No purgeable halocarbons of interest detected during sampling.

(Continued)

McSEMIAN/071688/JKS

No purgeable halocarbons of interest detected during sampling.

Trace (terminology used by USAF to quantify low levels of analytes).

<sup>=</sup> Not established.

		;	Carbon			•	•	
		벍	Tetrach (or ide	Chioroform	1.2-DCE	1,1,1-TCA	1.1-DCE	1.2-DCA
Monitoring	DOMS Action Levels:	25	5	100	16	200	•	-
Vells	U.S. EPA PMCL:	S.	5	100	¥	J.	^	5
OTHER ON-BASE AREAS	AREAS (Continued)							
<u>BW-10</u> (Continued)	(pənu							
02/86		<0.5						
03/86		<0.5						9.5
04/86		<0.5						
05/86		<0.5		9.0				
06/86		<0.5						
07/86		<0.5						
08/86		<0.5	<0.5(TR)					
98/60		<0.5						
10/86		<0.5						
11/86		<0.5						
12/86		<0.5						
01/87 to 12/87 - Only chi 10/87	37 - Only chloroform ra	nging in c	loroform ranging in concentrations from trace to 2.5 were detected.	n trace to 2.5 v	were detected		100	330
BW-28								
08/79 - Initi	Initial sampling							
12/81		<b>~</b>						
10/85		<0.5		1.4				
11/85		<0.5						
12/85		<0.5						
01/86		<0.5						
02/86		<0.5				9.0		
03/86		<0.5						
04/86		<0.5						

MCSEMIAN/071688/JKS

No purgeable halocarbons of interest detected during sampling.
 TR = Trace (terminology used by USAF to quantify (ow levels of analytes).
 NE = Not established.

MCSEMIAN/071688/JKS

(Continued)

<sup>\*</sup> No purgeable halocarbons of interest detected during sampling.

TR = Trace (terminology used by USAF to quantify low levels of analytes).

IE = Not established.

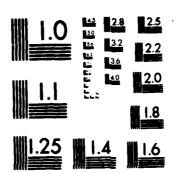
TABLE C-1. (Continued)

; N N N N N N N N N N N N N N N N N N N	Compounds (ug/L)	#	## 10	Compo	Compounds (ug/L)	60 60 60 50 10 10 10 10 10 10 10 10	44 16 19 19 19 19 19 19 19 19 19	# # # # # # # # # # # # # # # # # # #
		106	Carbon Tetrachloride	<u>Chloroform</u>	1,2-0CE	1, 1, 1-TCA	1,1-DCE	1,2-DCA
Monitoring Wells	DOMS Action Levels: U.S. EPA PMCL:	<b>2</b> 2	5 5	100	16 A	200 NE	9 ~	~ w
OTHER ON-BASE	E AREAS (Continued)							
BW-29 (Continued)	nued)							
12/85		<0.5						
01/86		<0.5						
02/86		<0.5						
03/86		<0.5						
04/86		<0.5						
05/86		<0.5						
98/90		<0.5						
07/86		<0.5						
08/86		<0.5						
98/60		<0.5						
10/86		<0.5						
11/86		<0.5		9.0				
12/86		<0.5						
01/87		<0.5						
02/87		<0.5		9.0				
03/87		<0.5		0.5				
05/87		<0.5						
06/87		<0.5		1.2				
07/87		<0.5		5.4				
08/87		<0.5		TR.				
28/60		<0.5		¥				
11 H H H H H H H H H H H H H H H H H H		# # # #			# # # # # # # # # # #	14 14 14 15 16 16 16 18 18 18	H H H H H H H H H	H H H H H H

No purgeable halocarbons of interest detected during sampling. Trace (terminology used by USAF to quantify low levels of analytes).

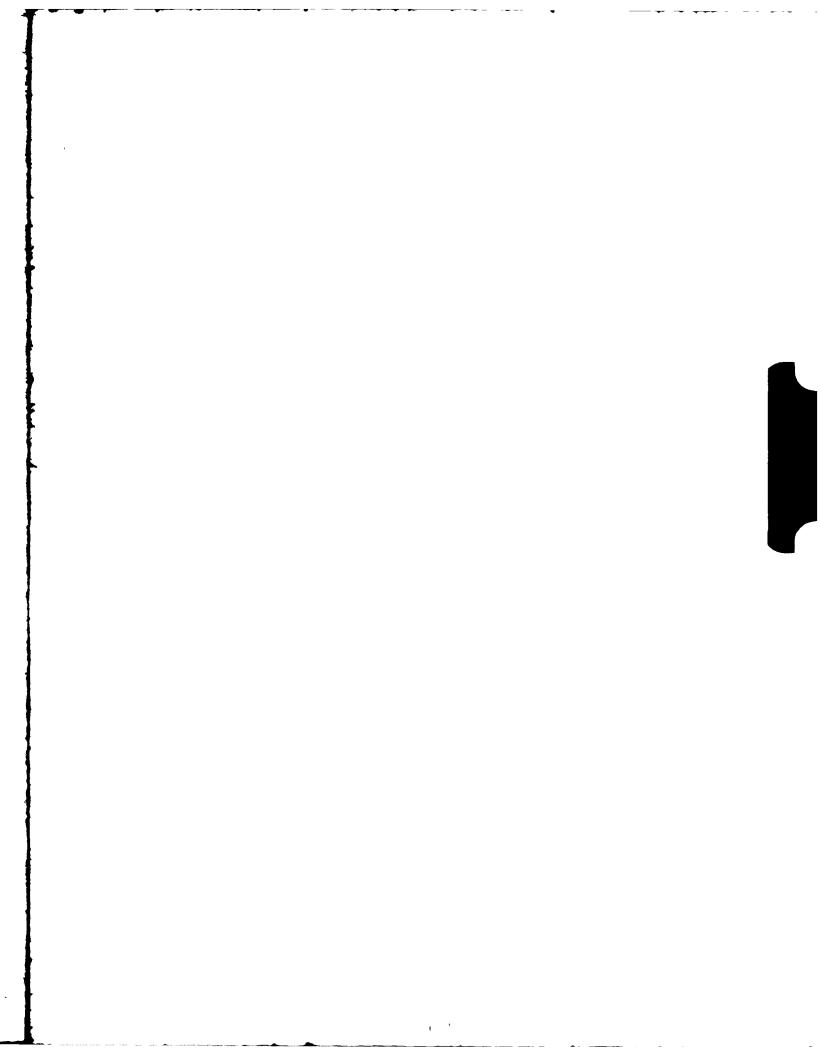
Not established. # W

AD-8198 861 UNCLASSIFIED F/G 24/4 



MICROCOPY BE OLIVER

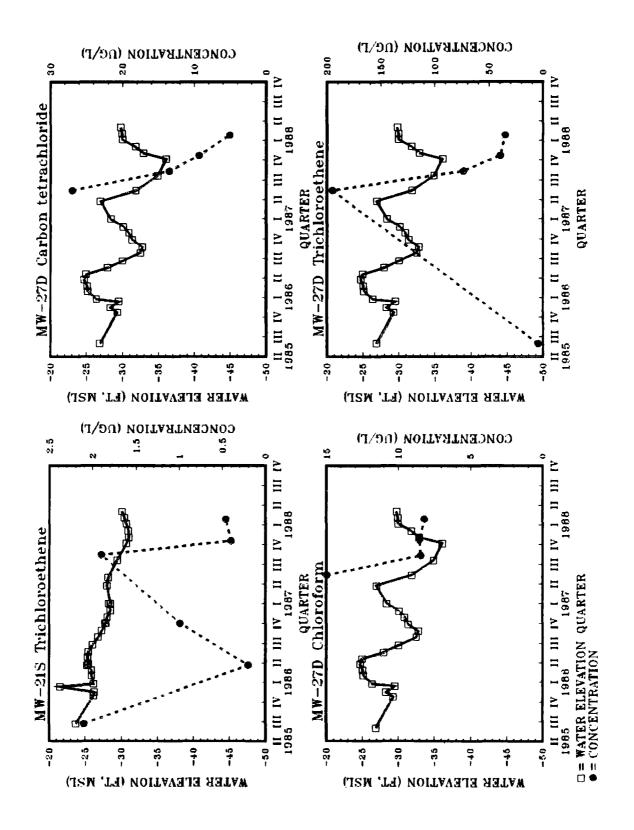
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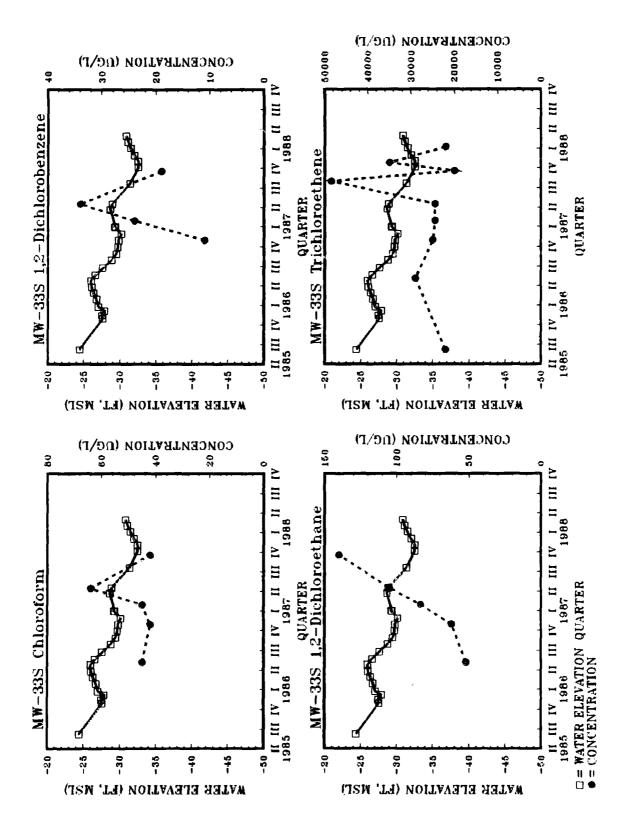


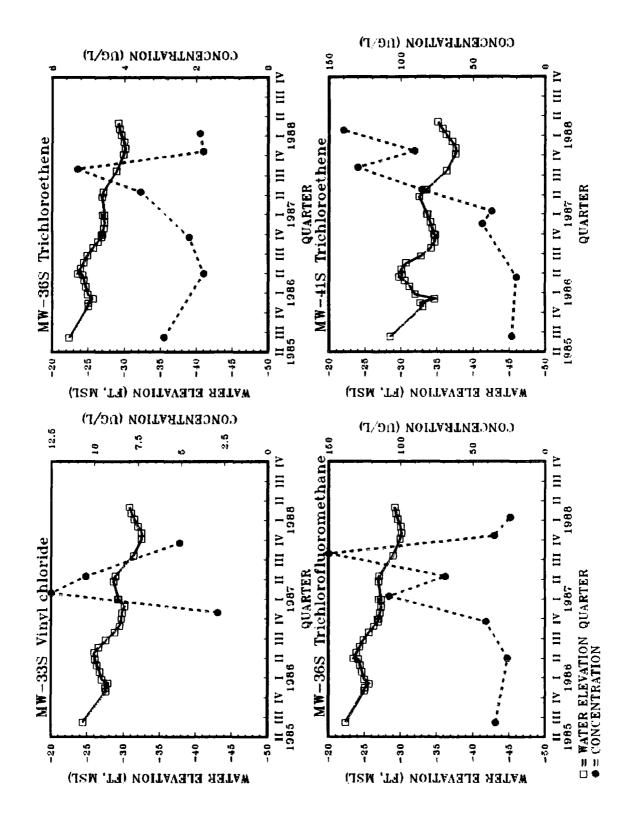
## RAPIAN

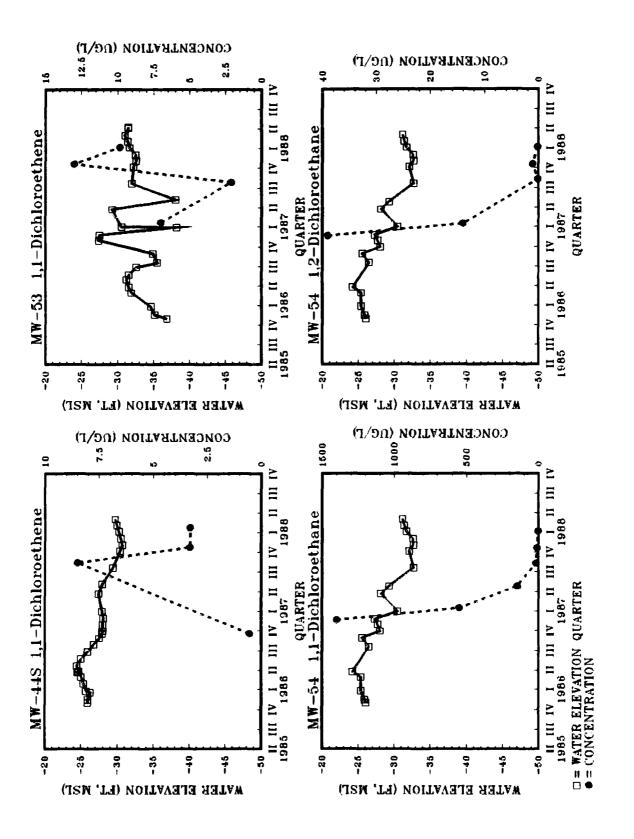
#### APPENDIX D

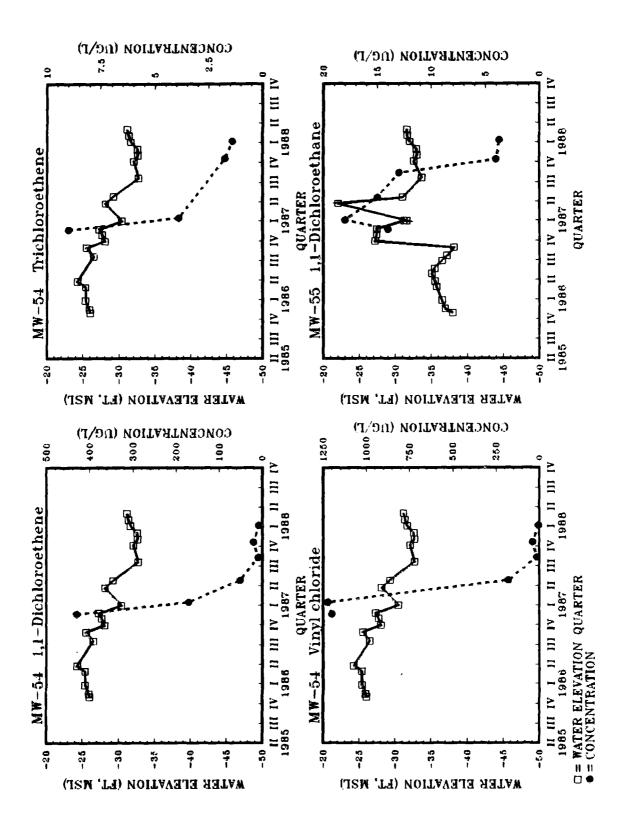
Time Series Plots of Contaminant Concentrations Versus Water Levels

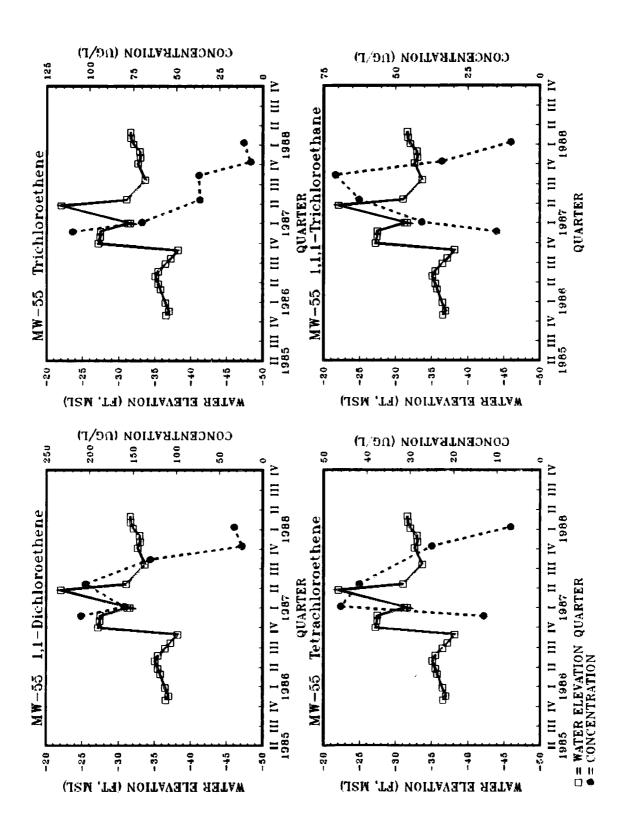


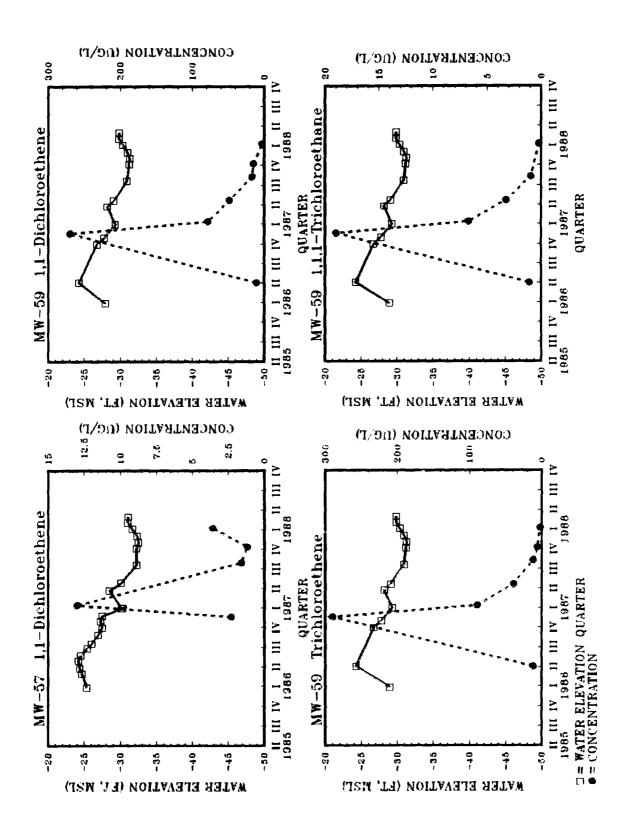


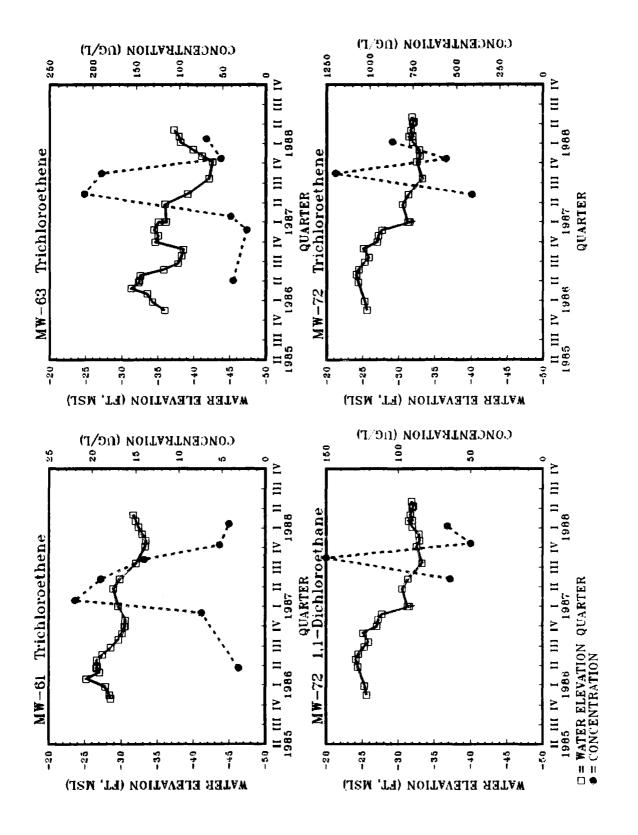


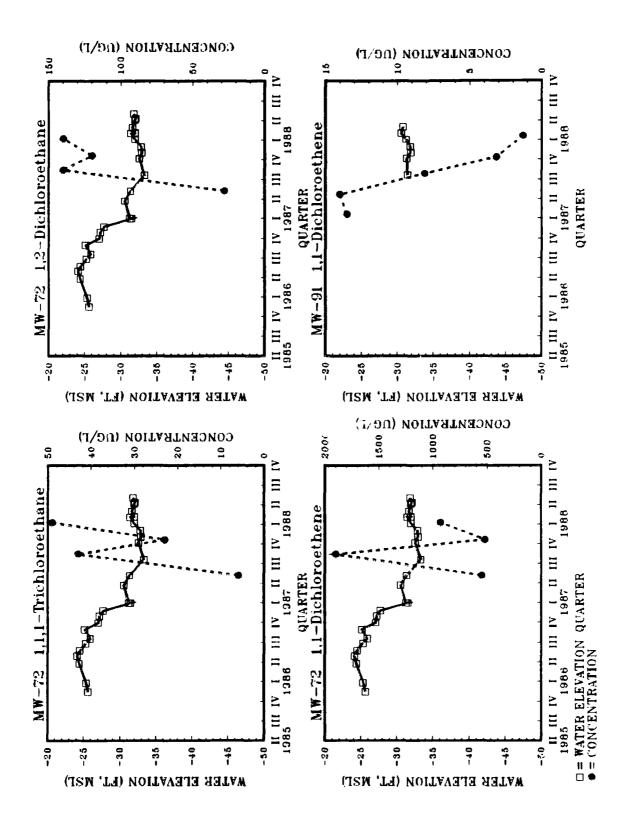


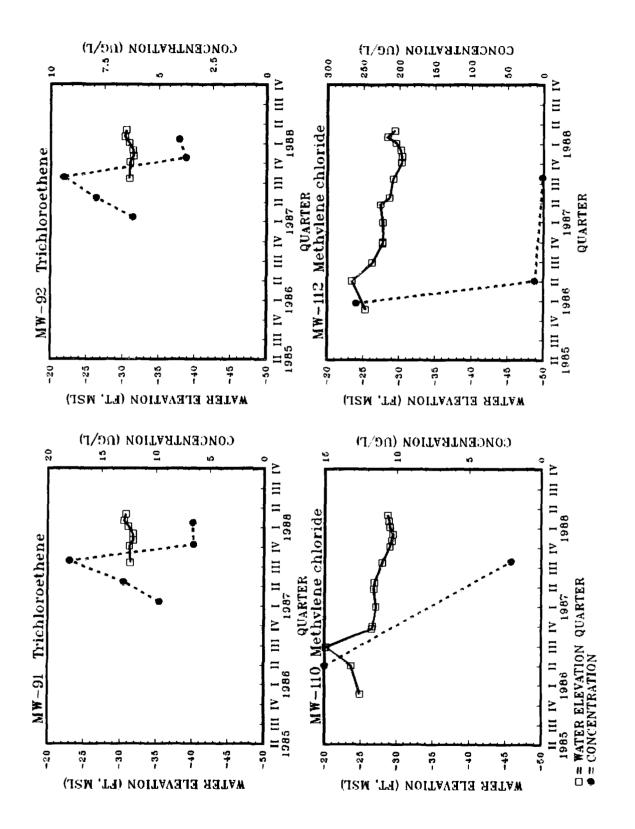


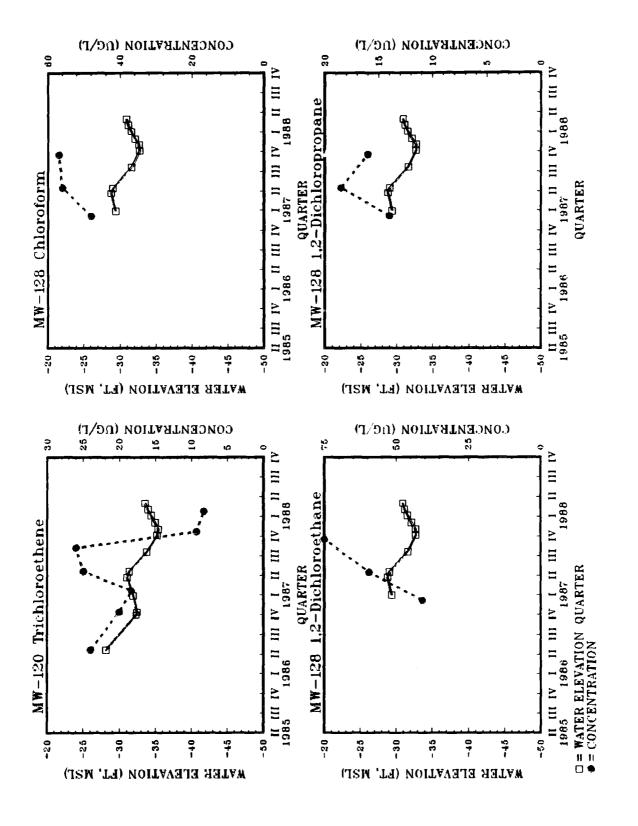


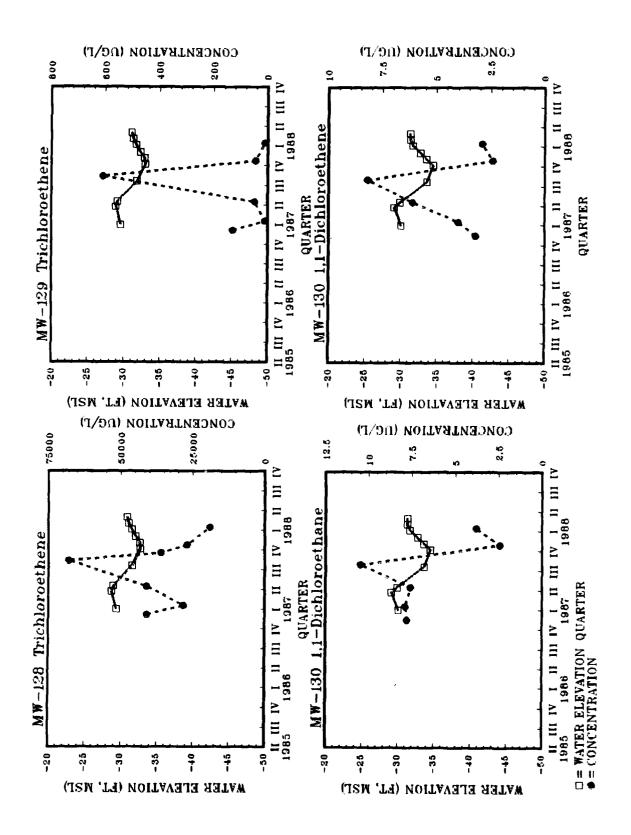


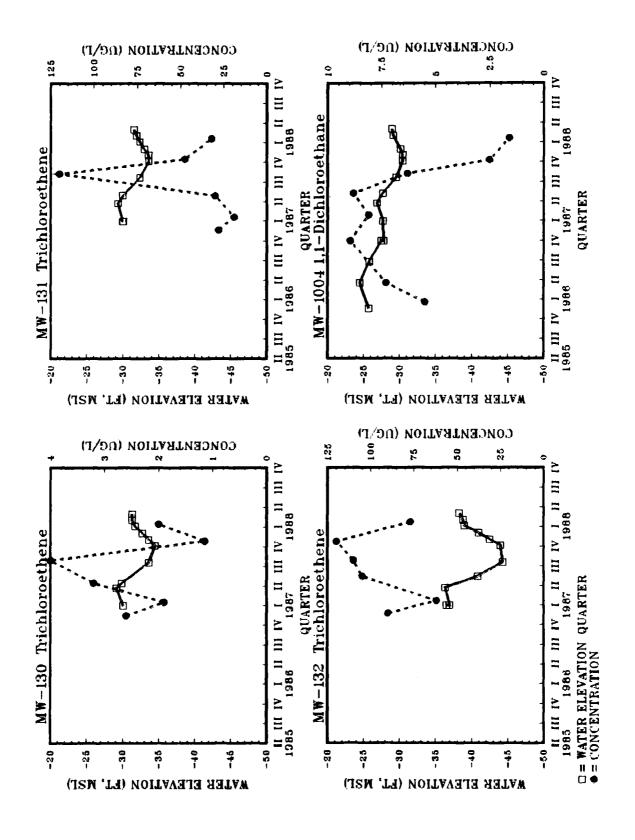


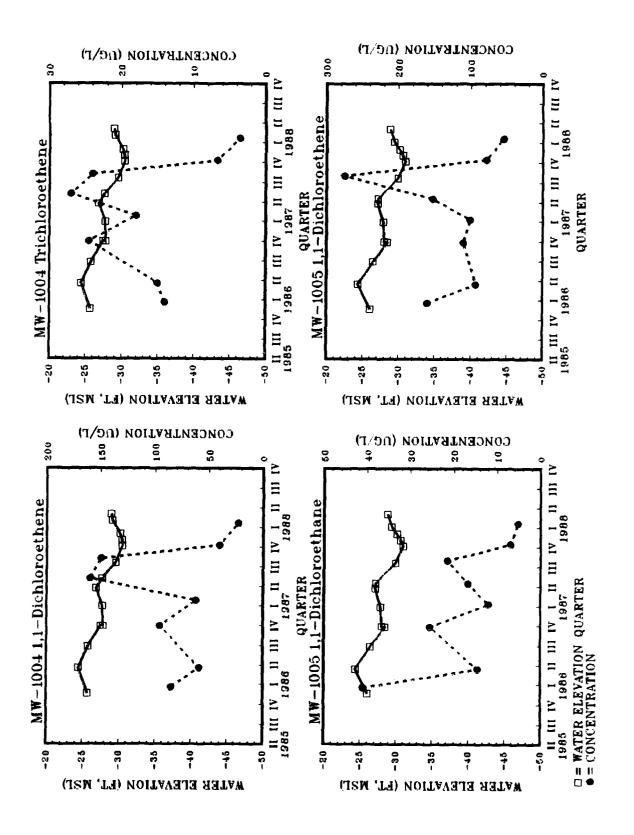


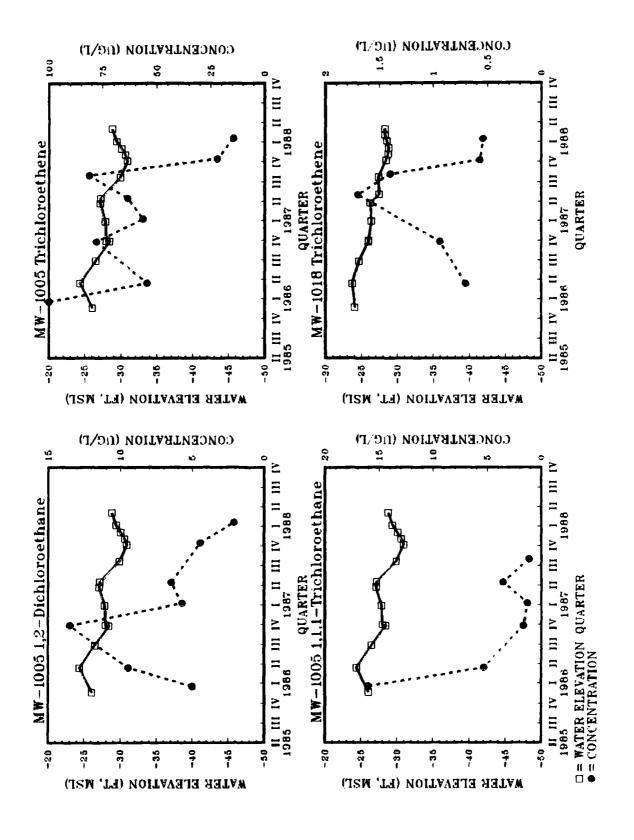


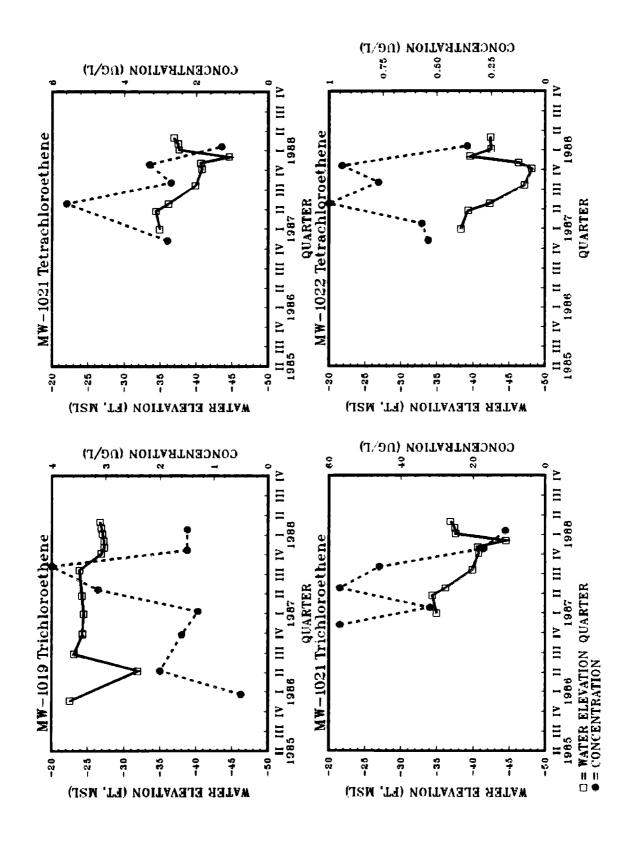


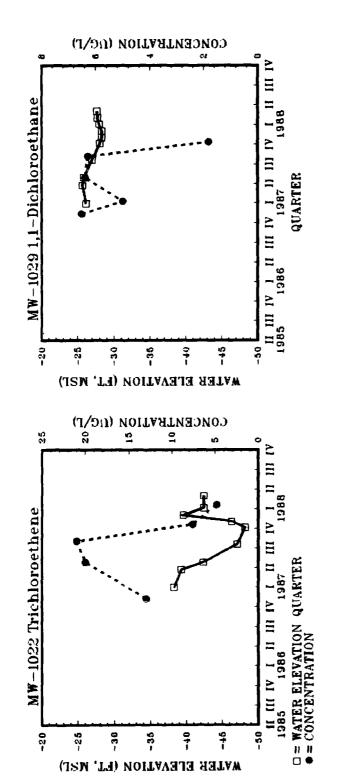


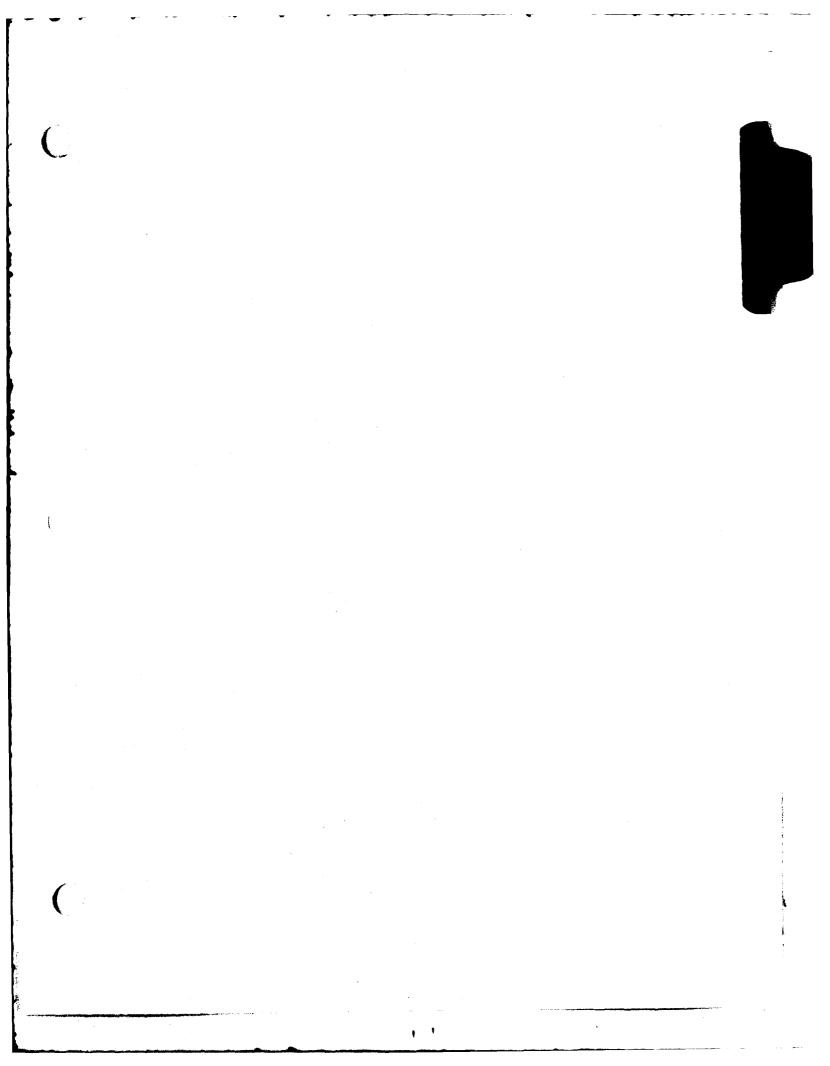


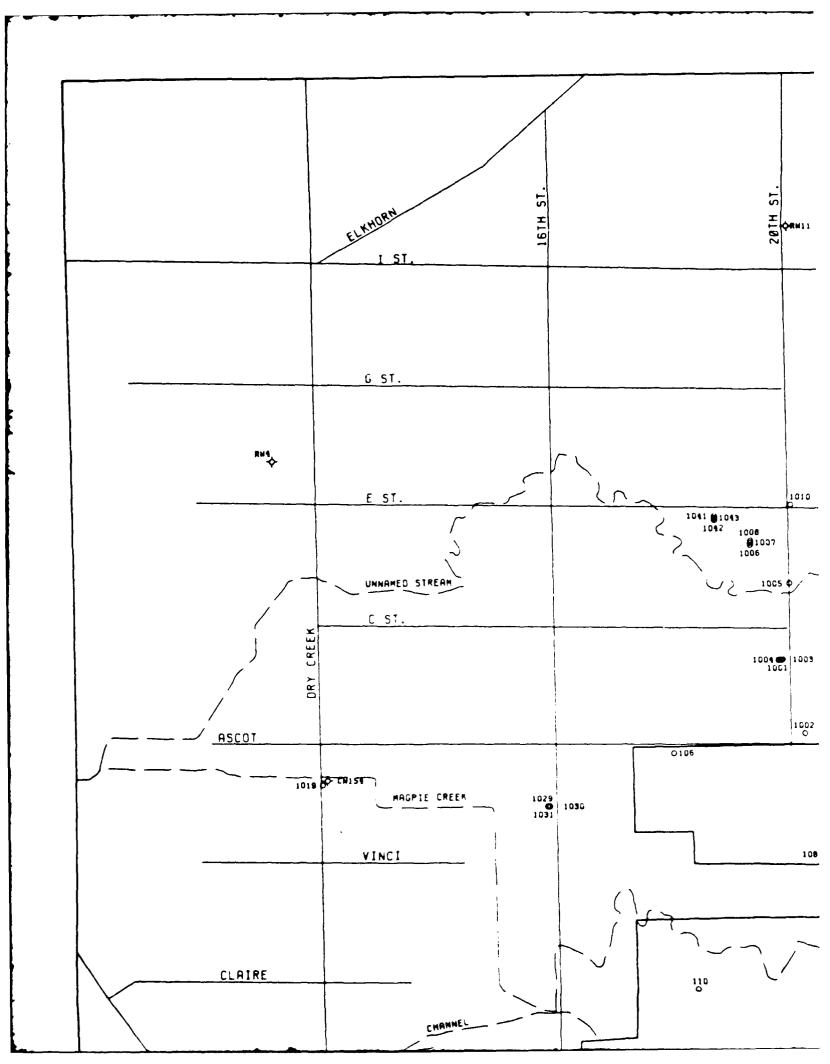


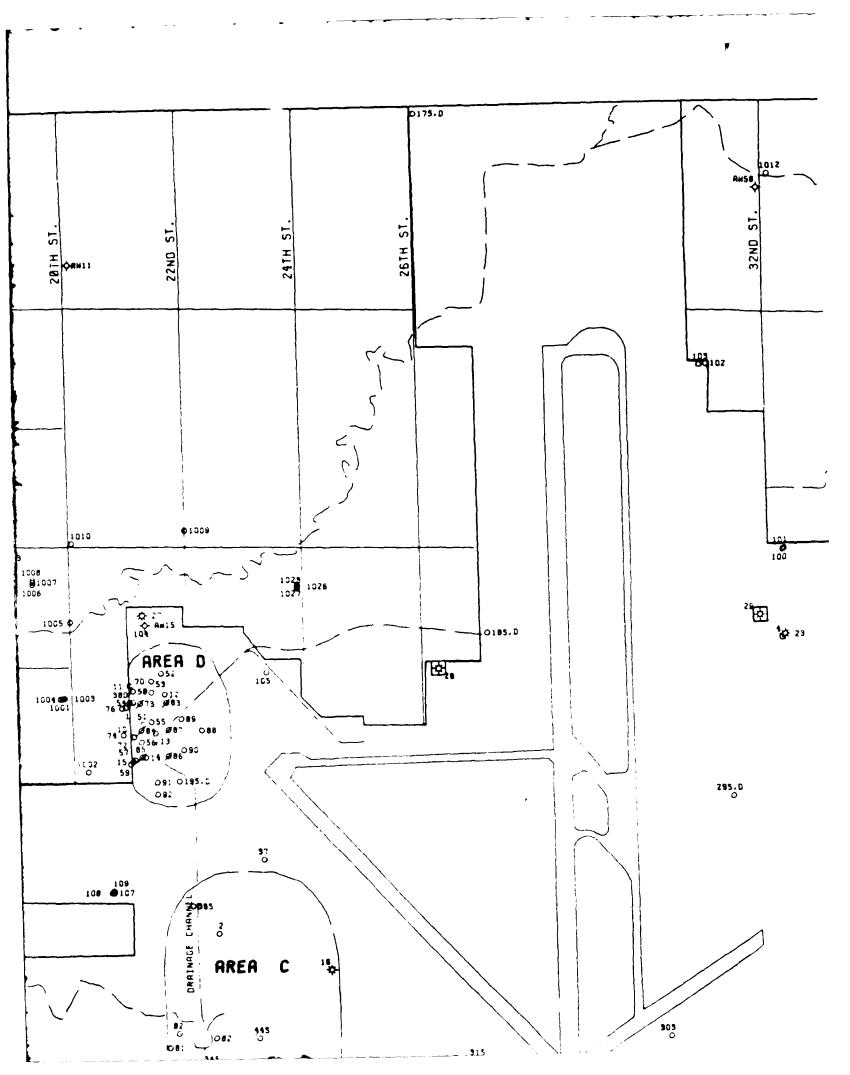


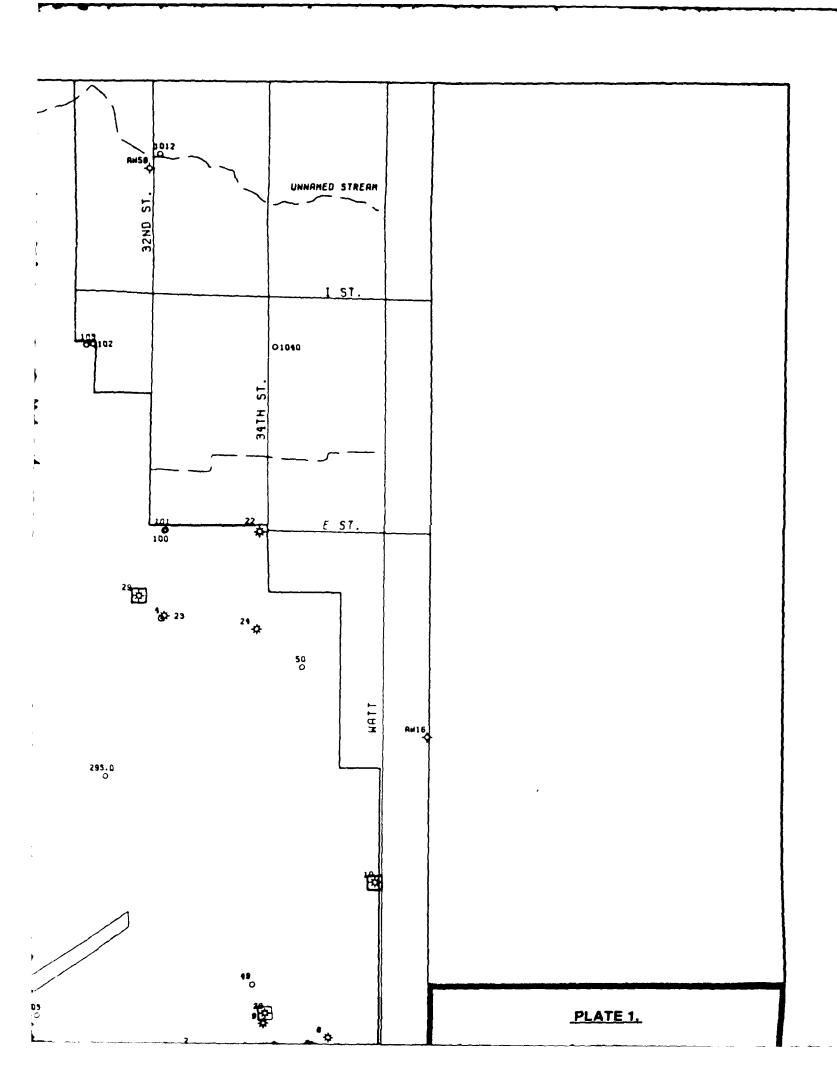


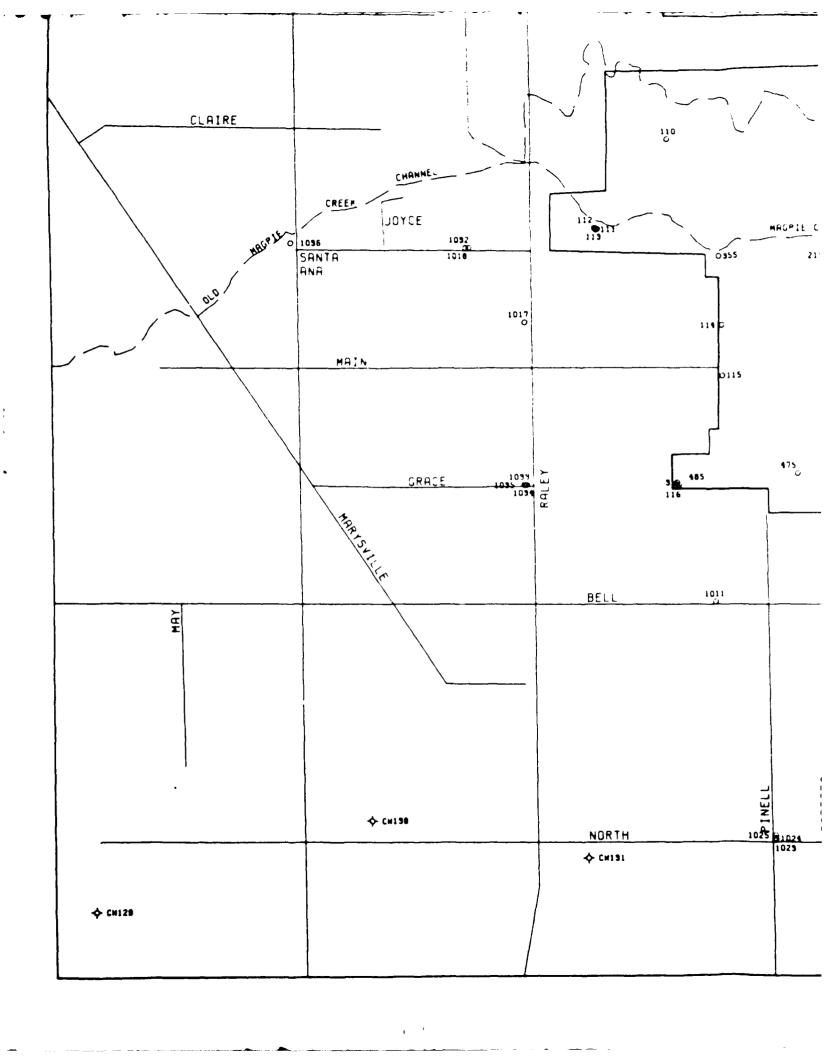


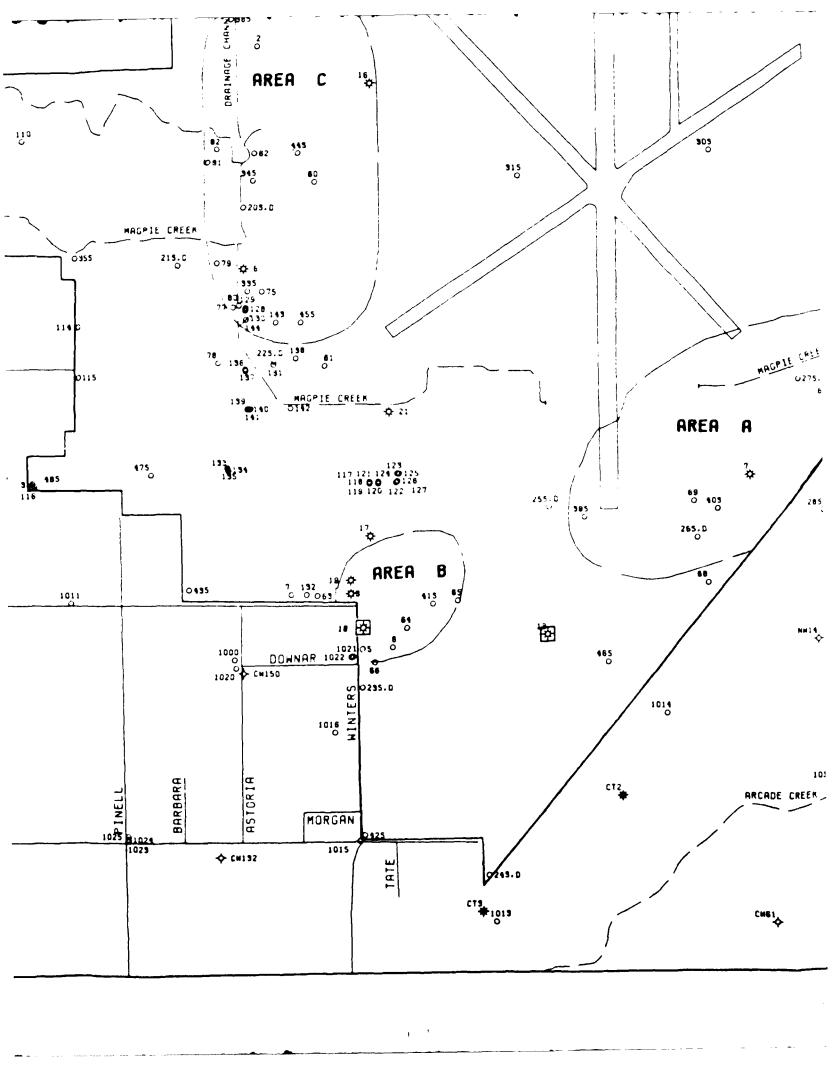


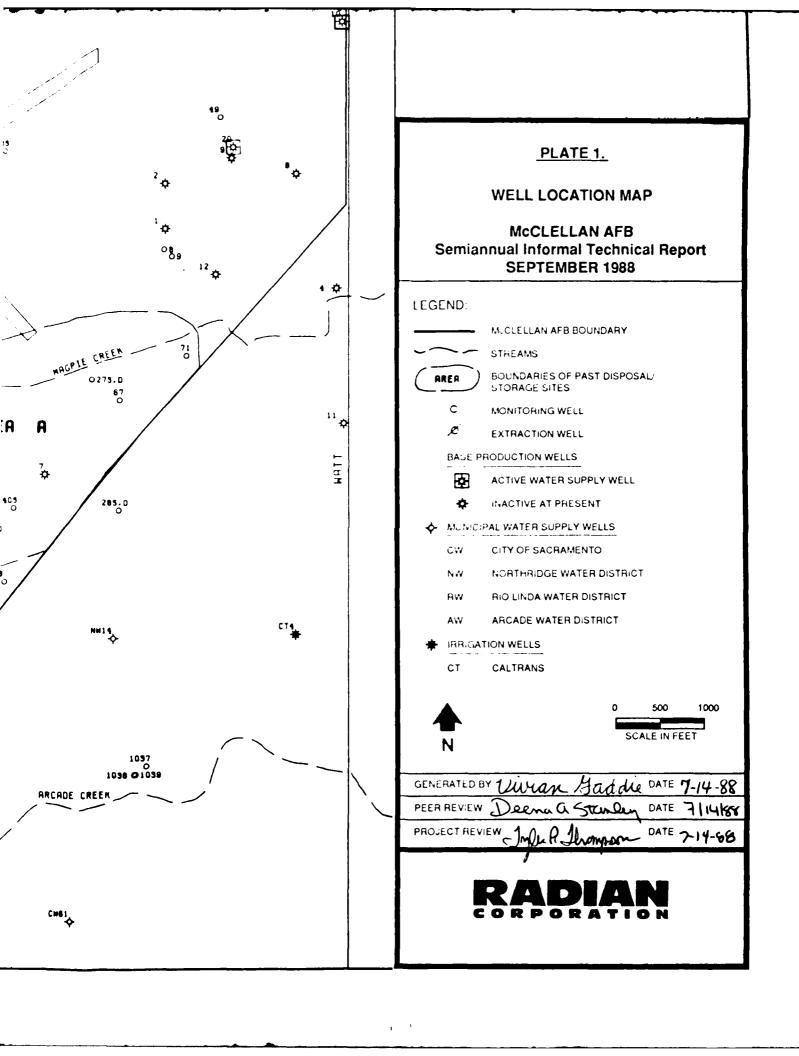


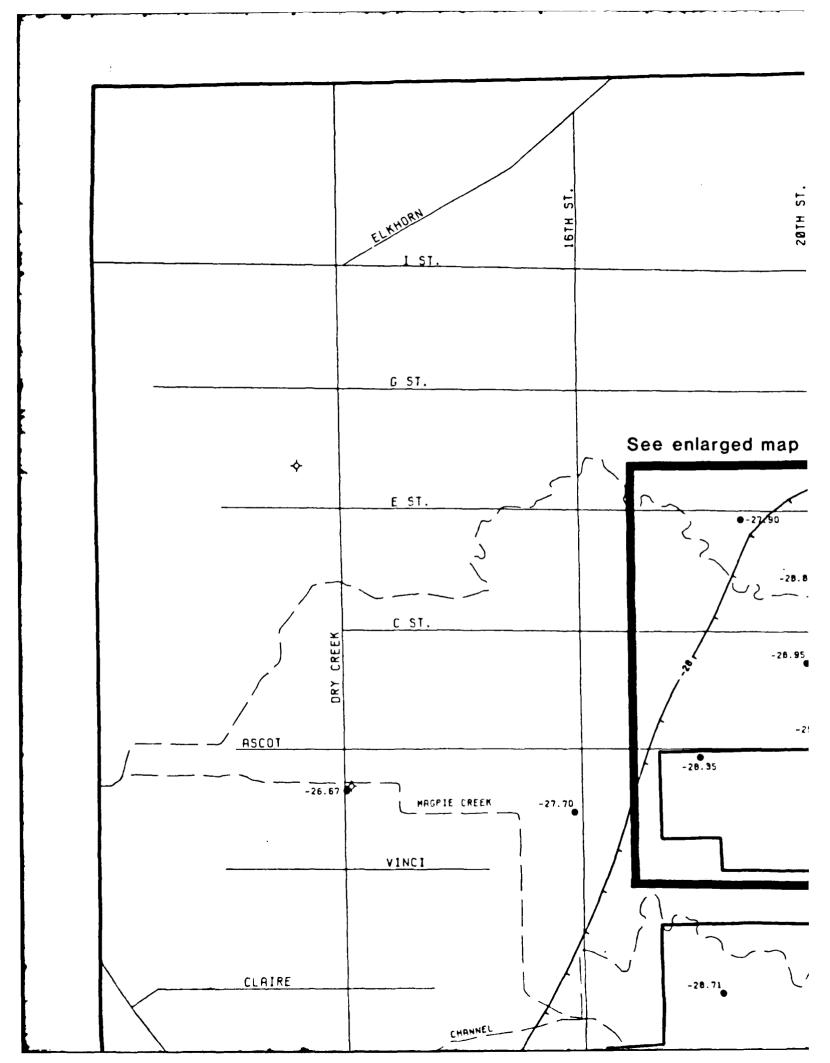


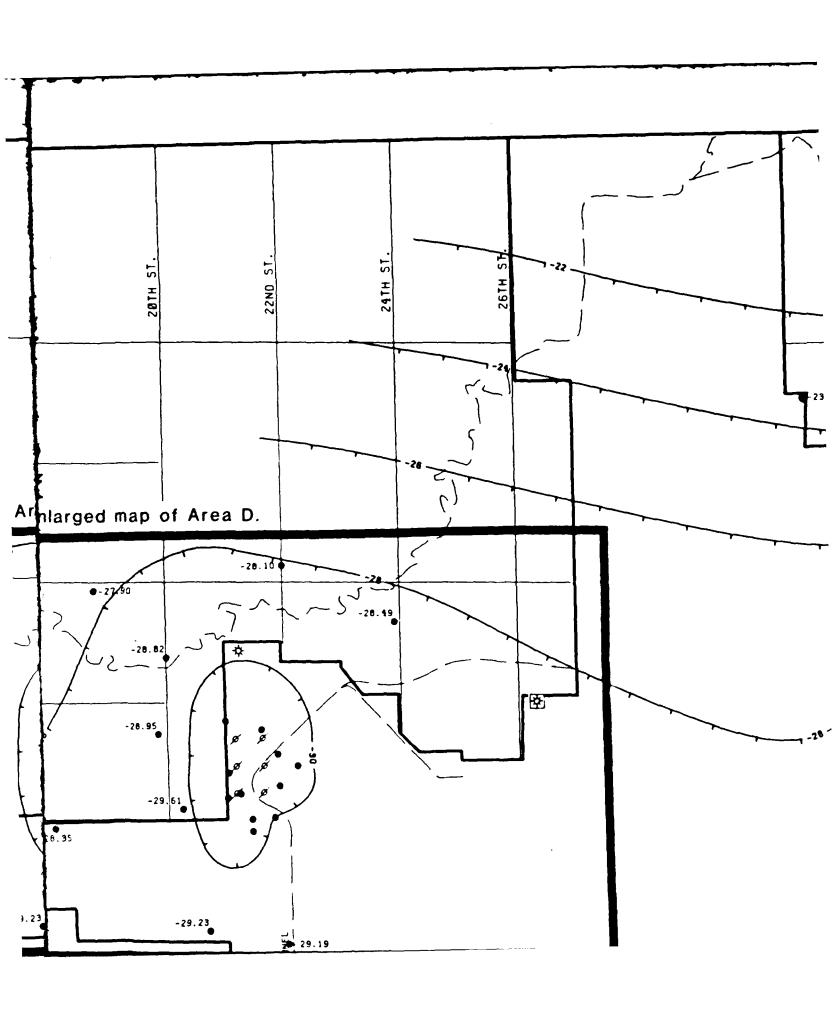


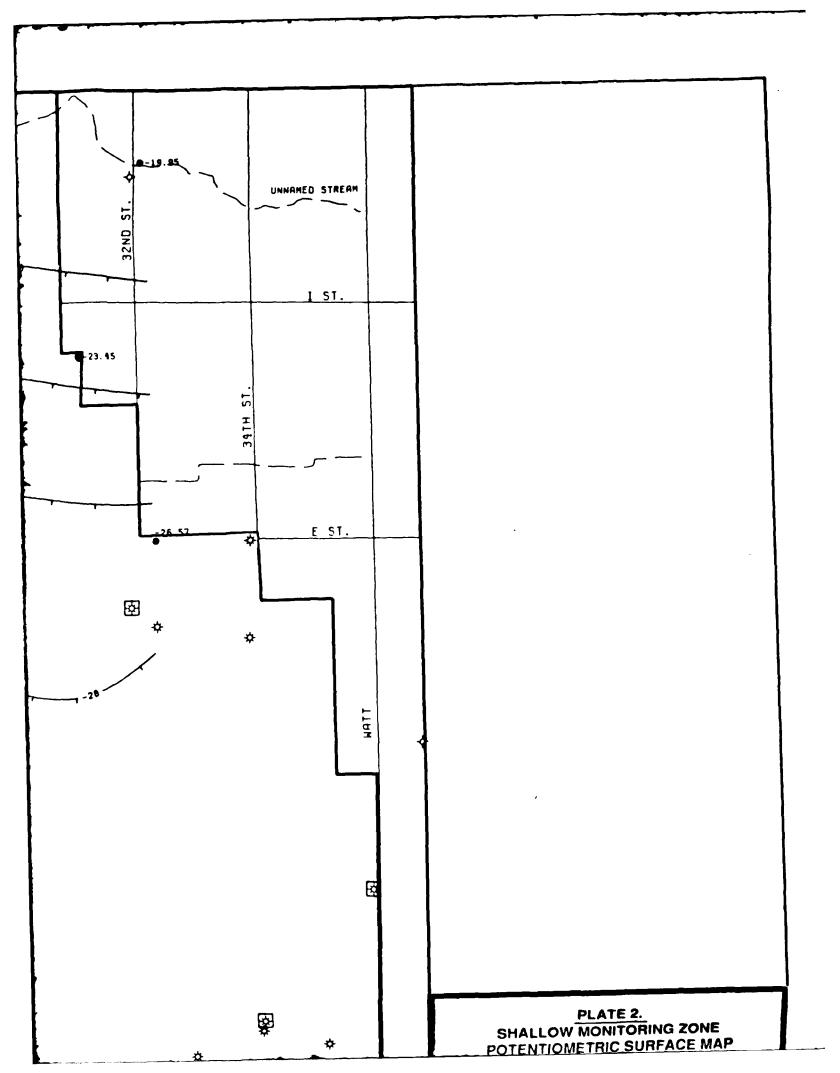


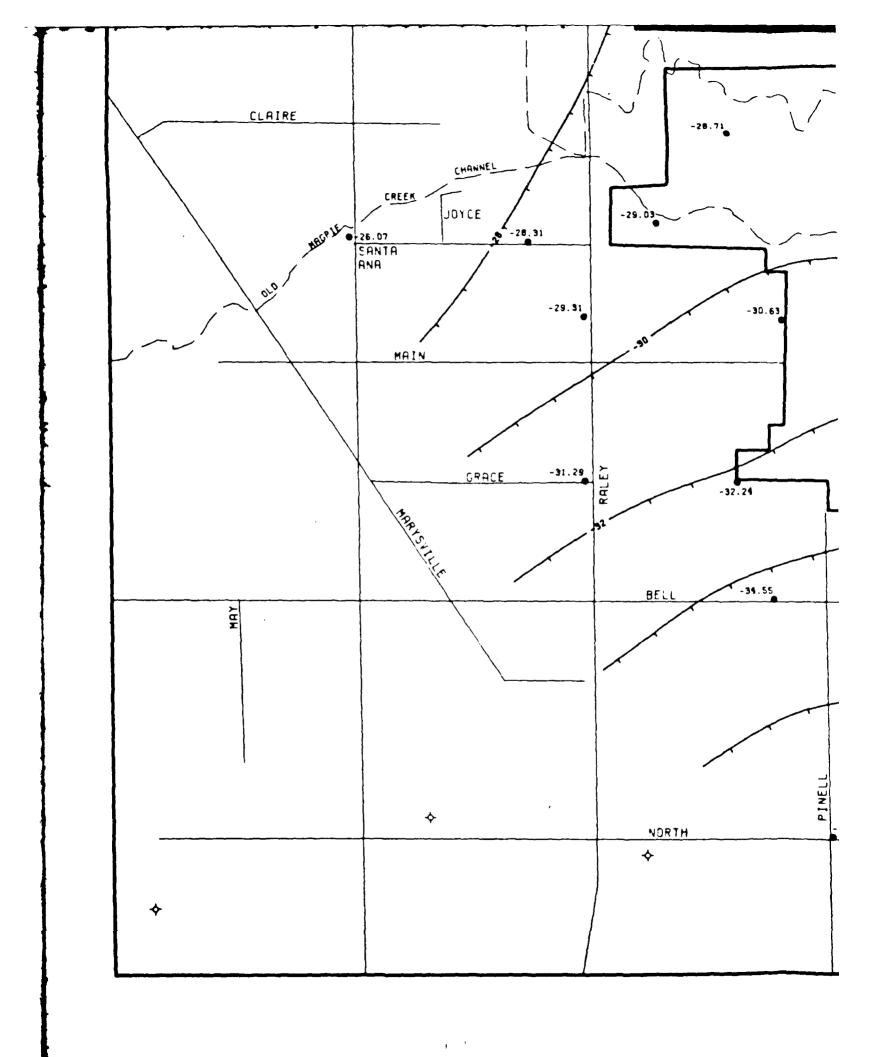


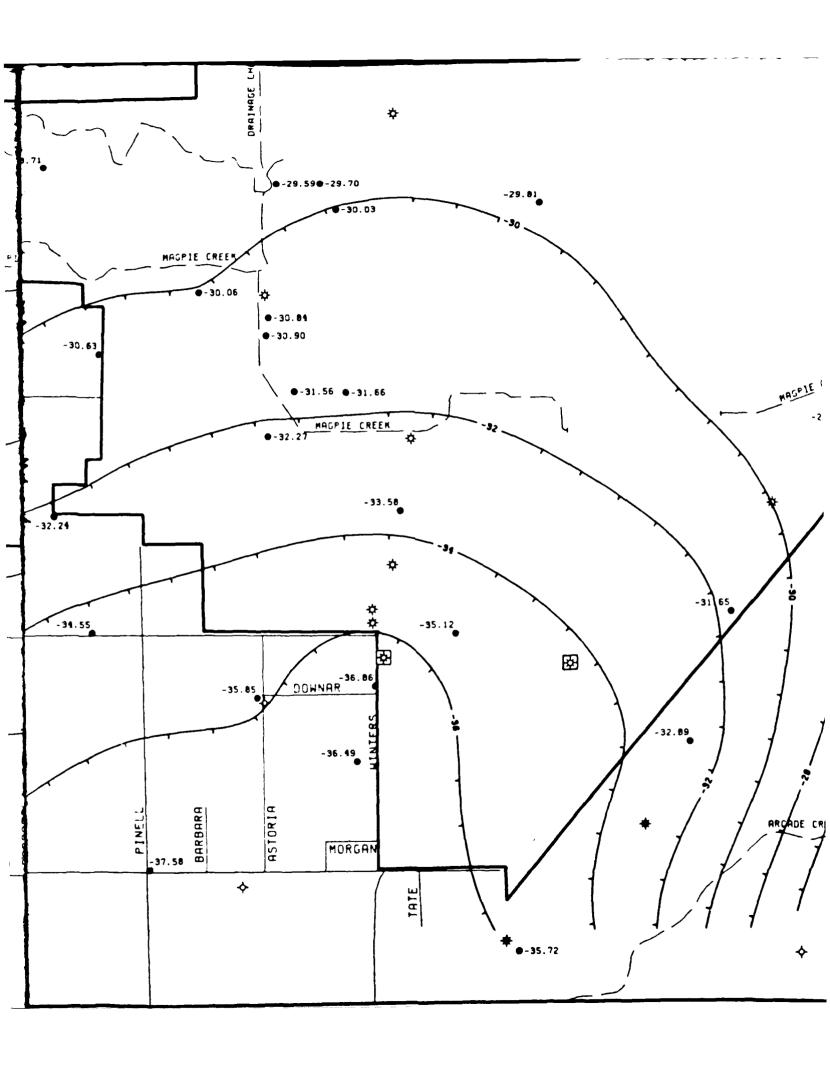


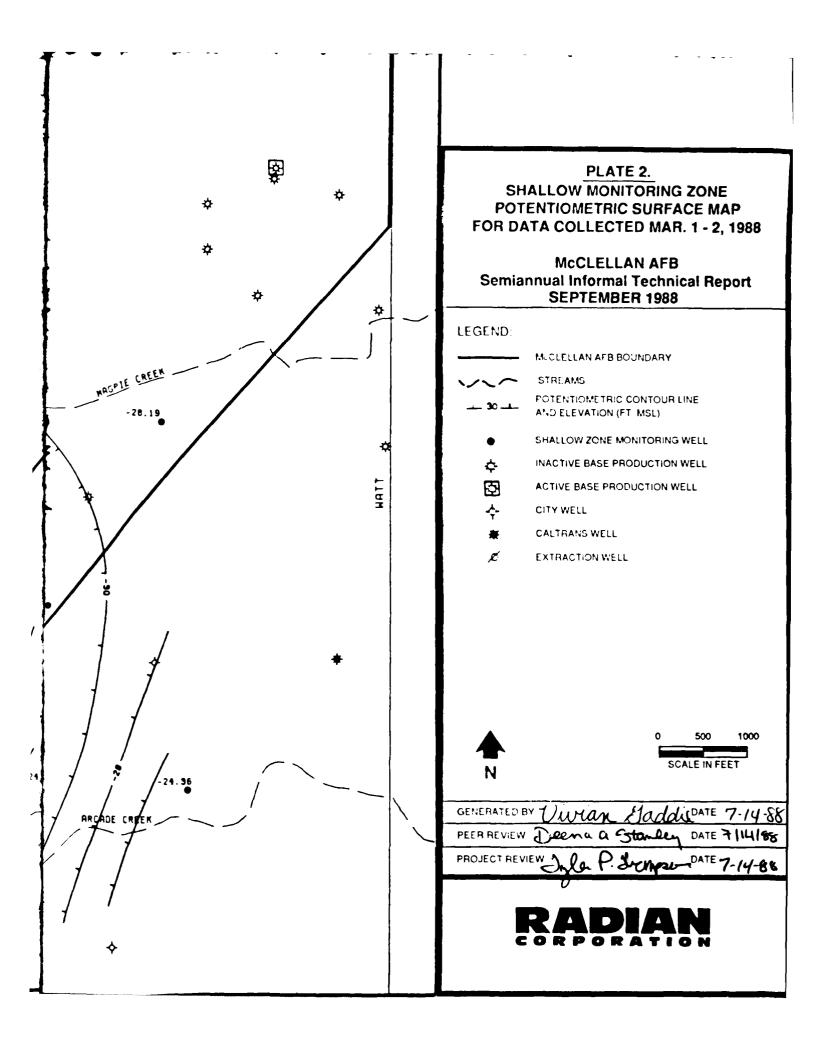


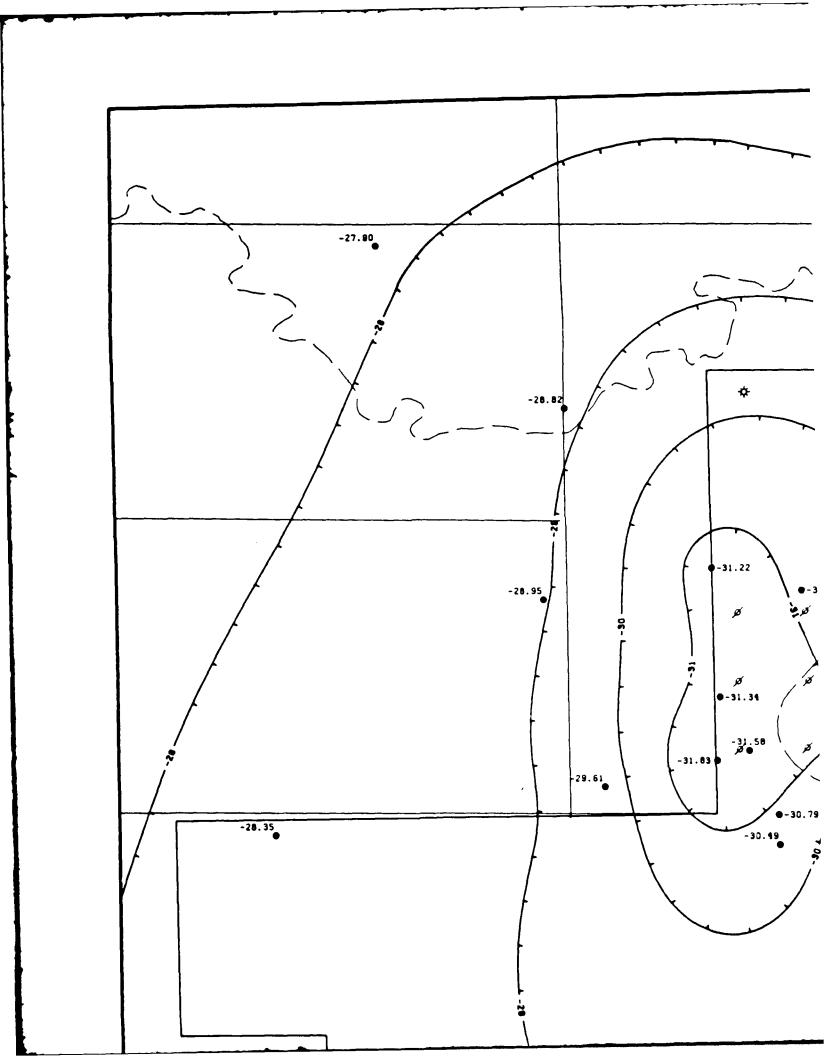


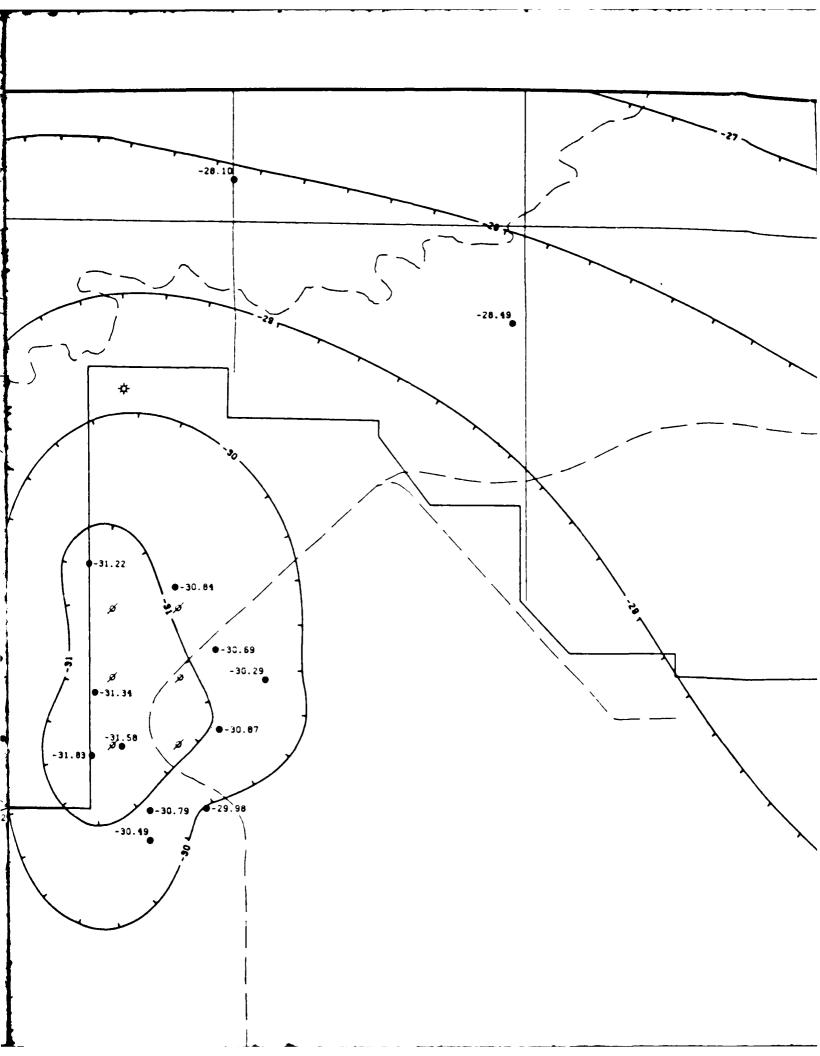


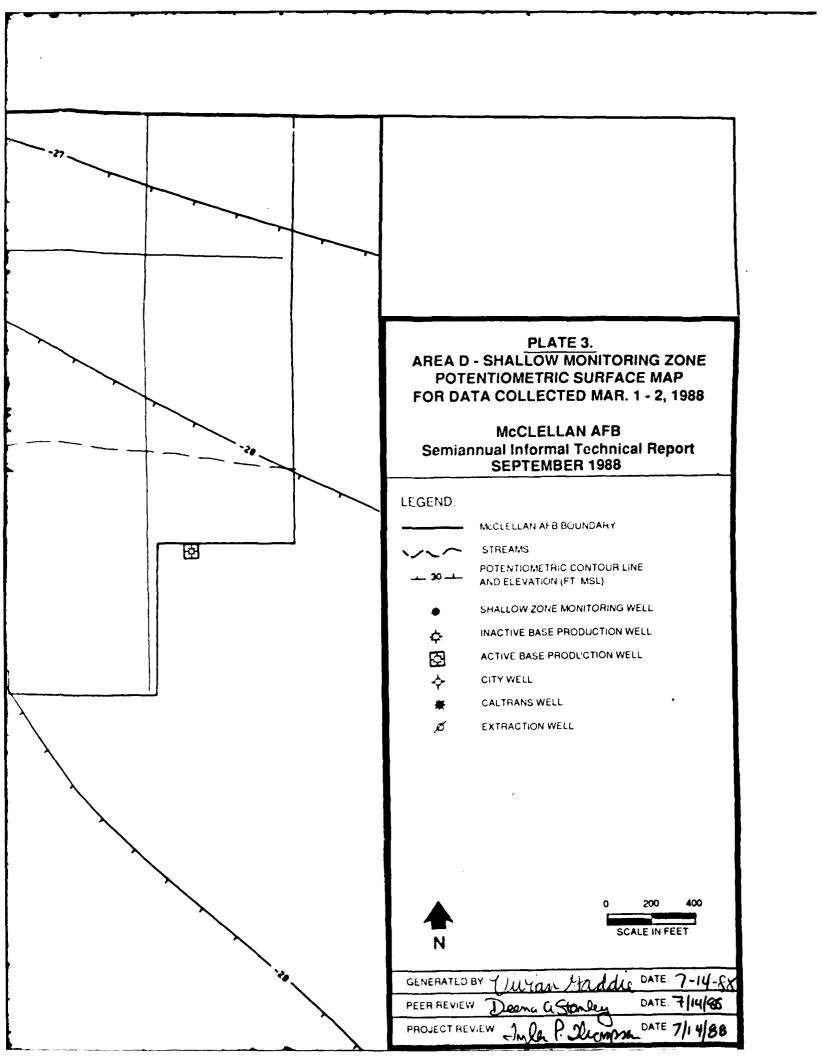


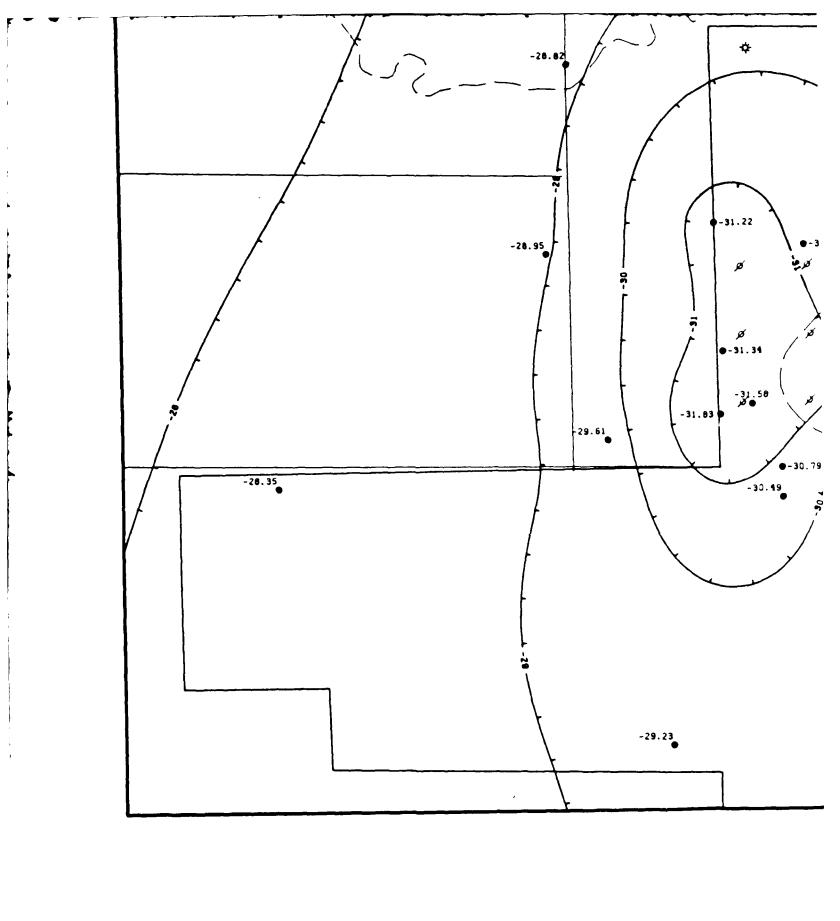


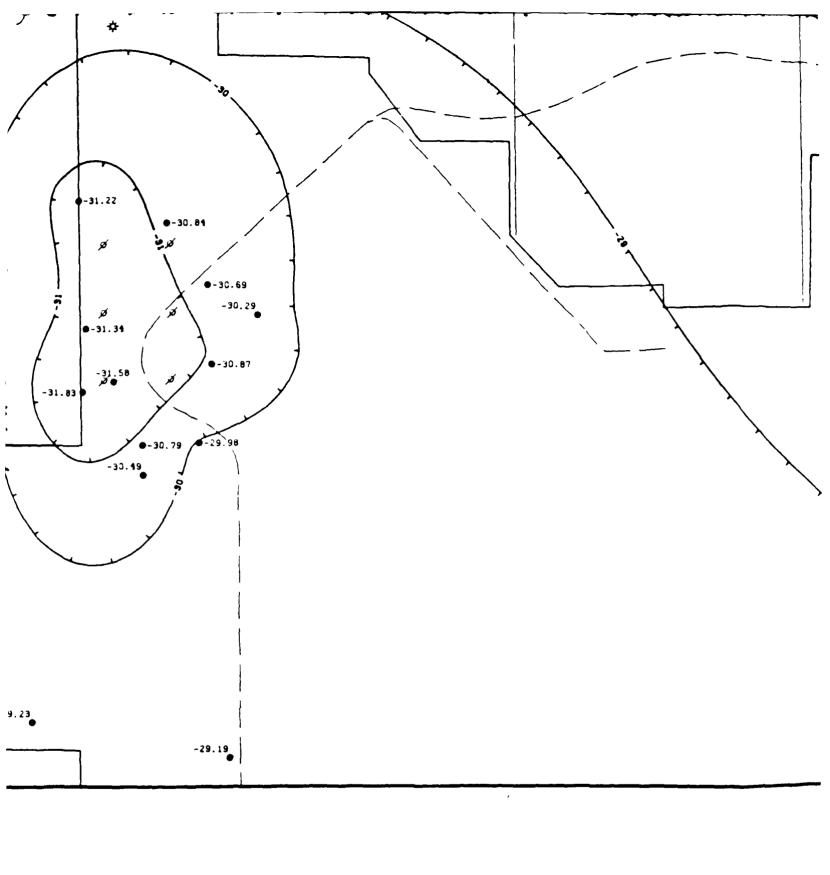




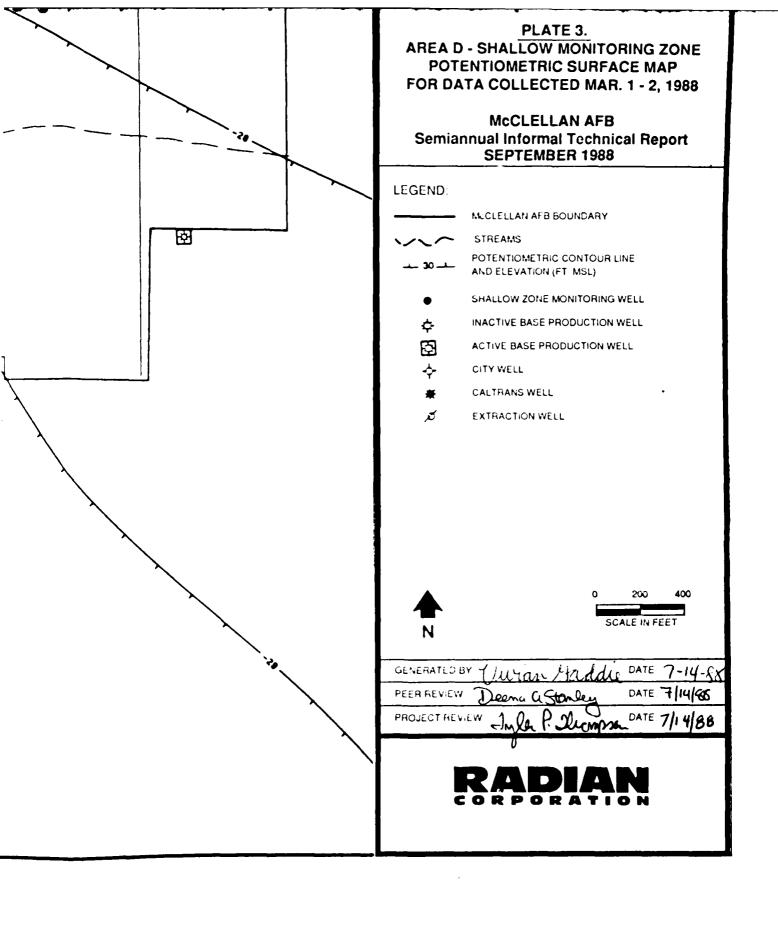


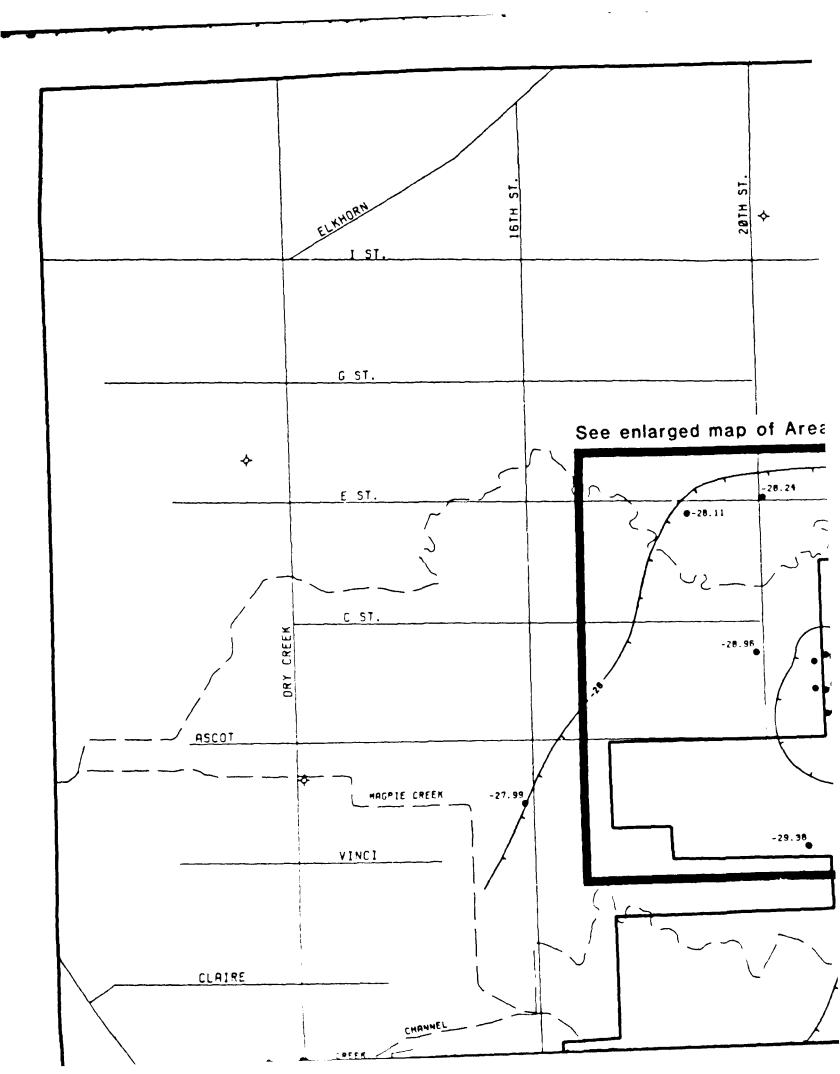


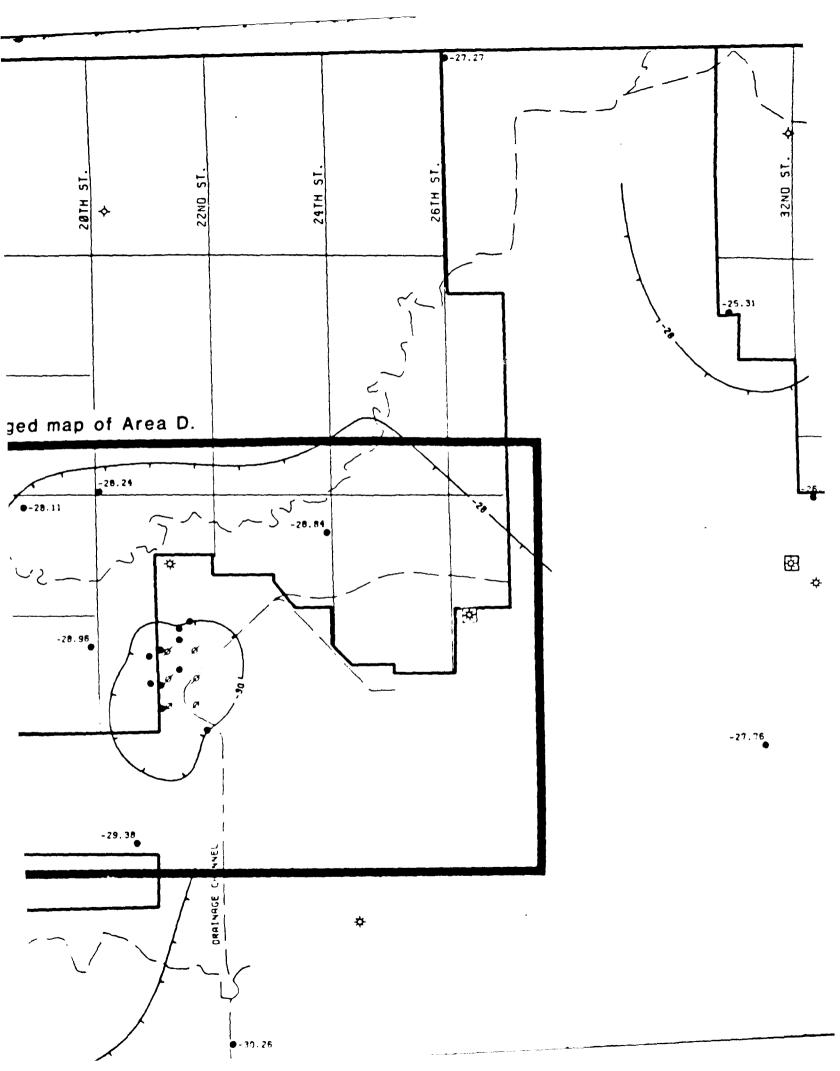


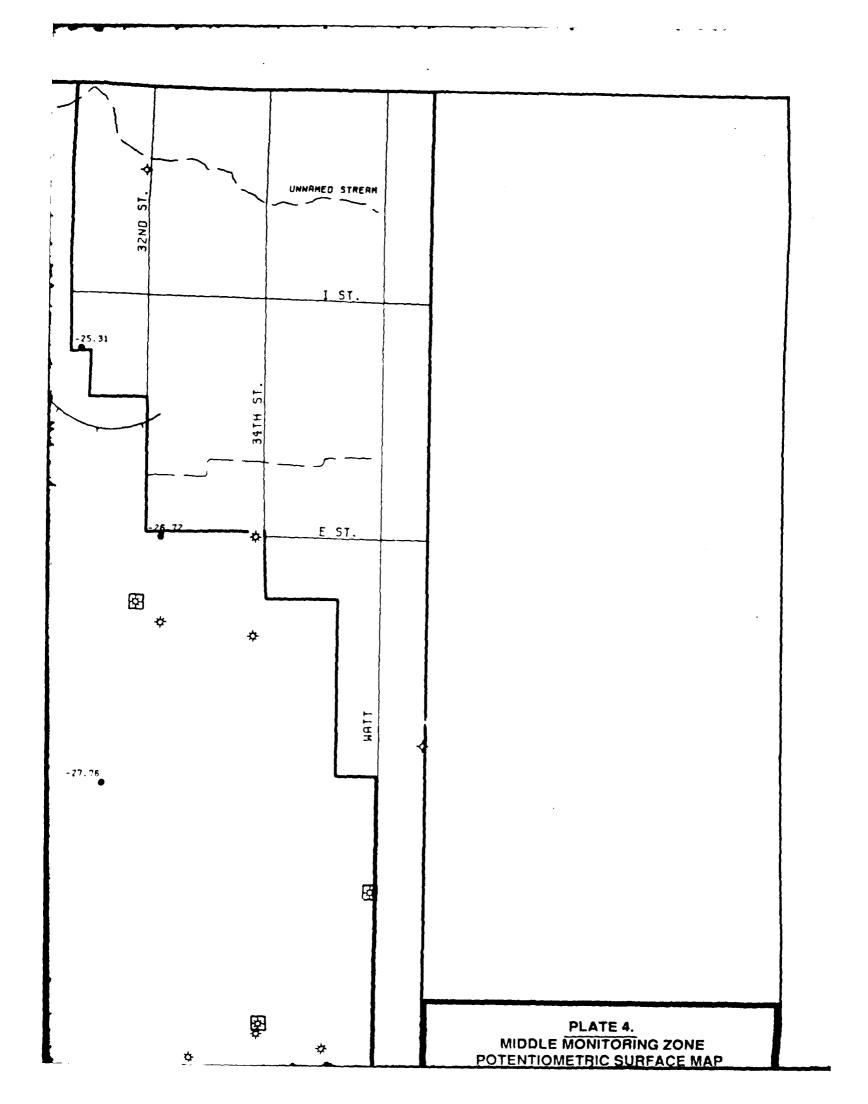


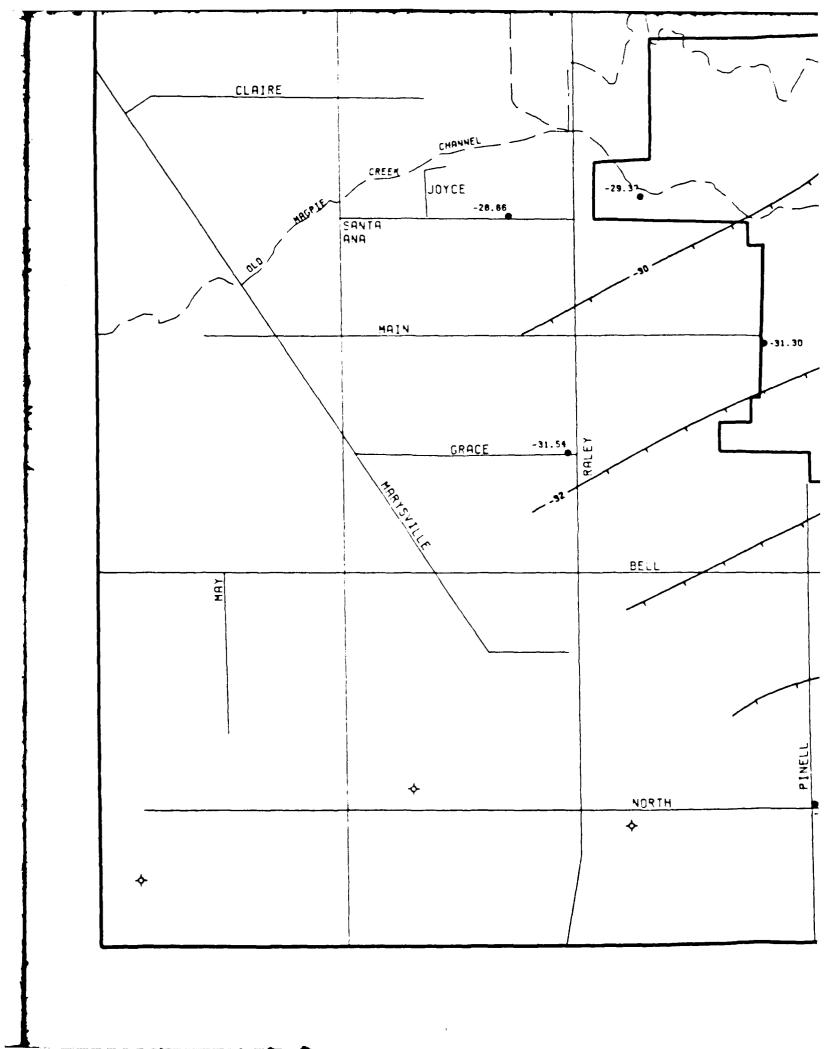
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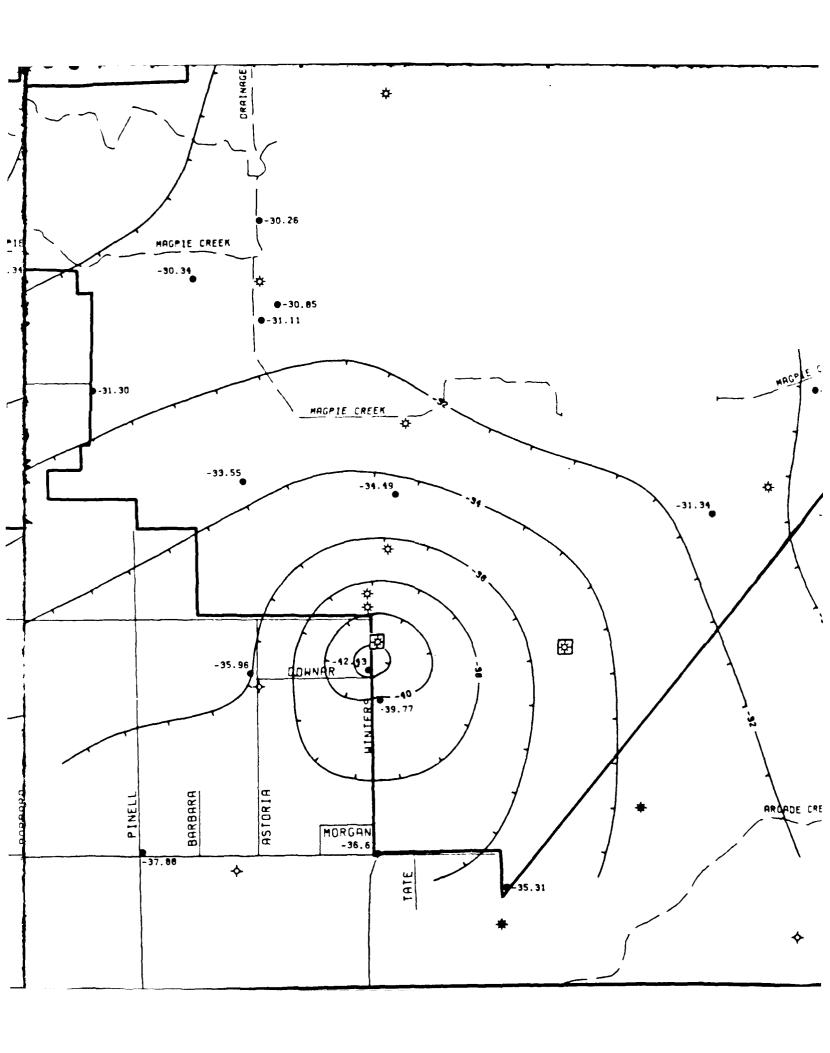


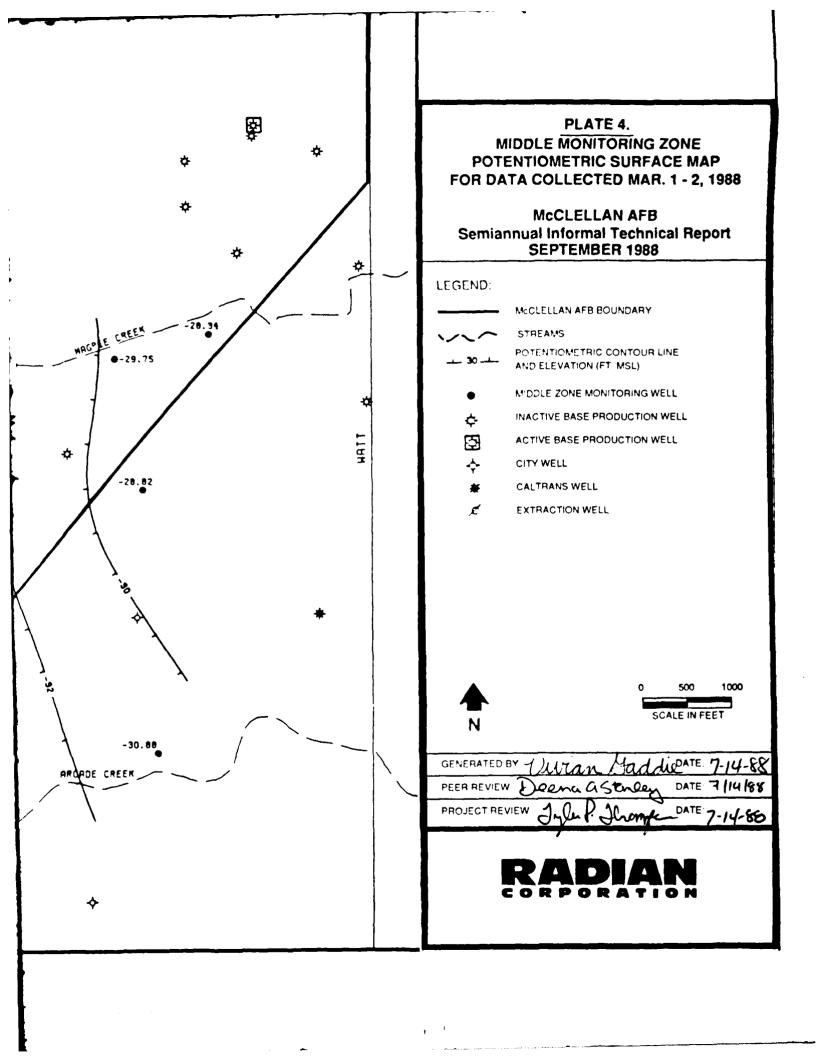


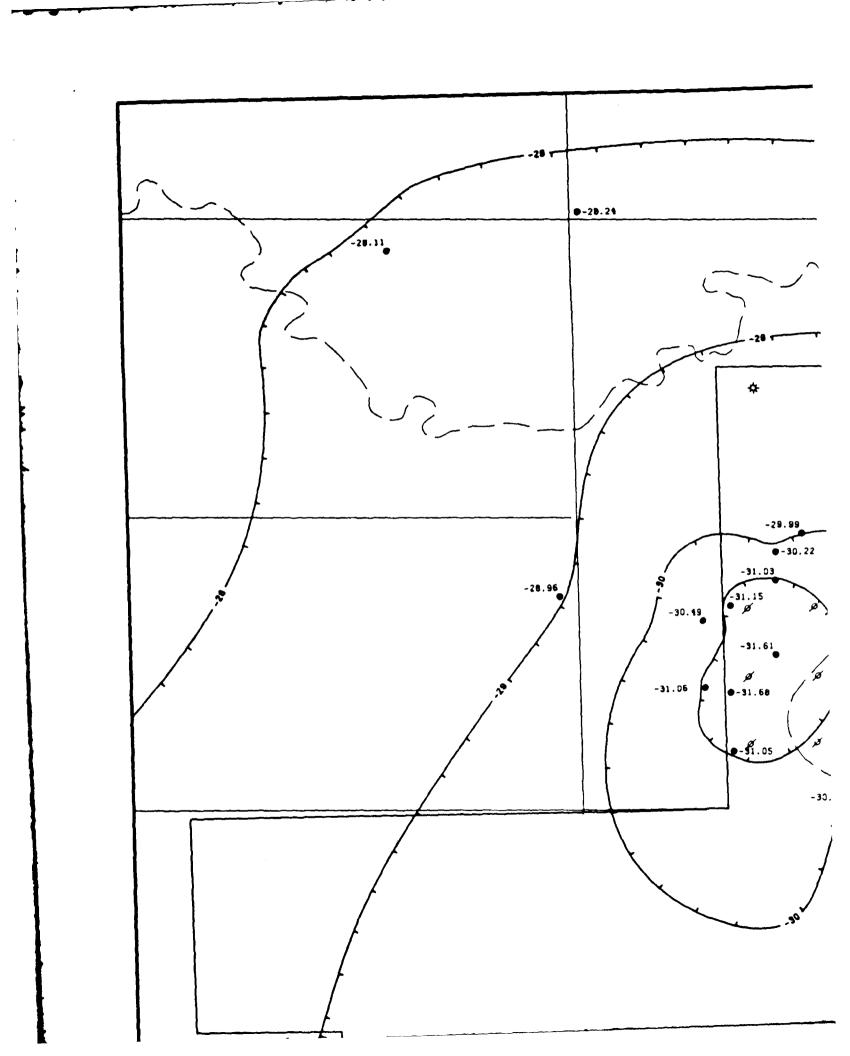


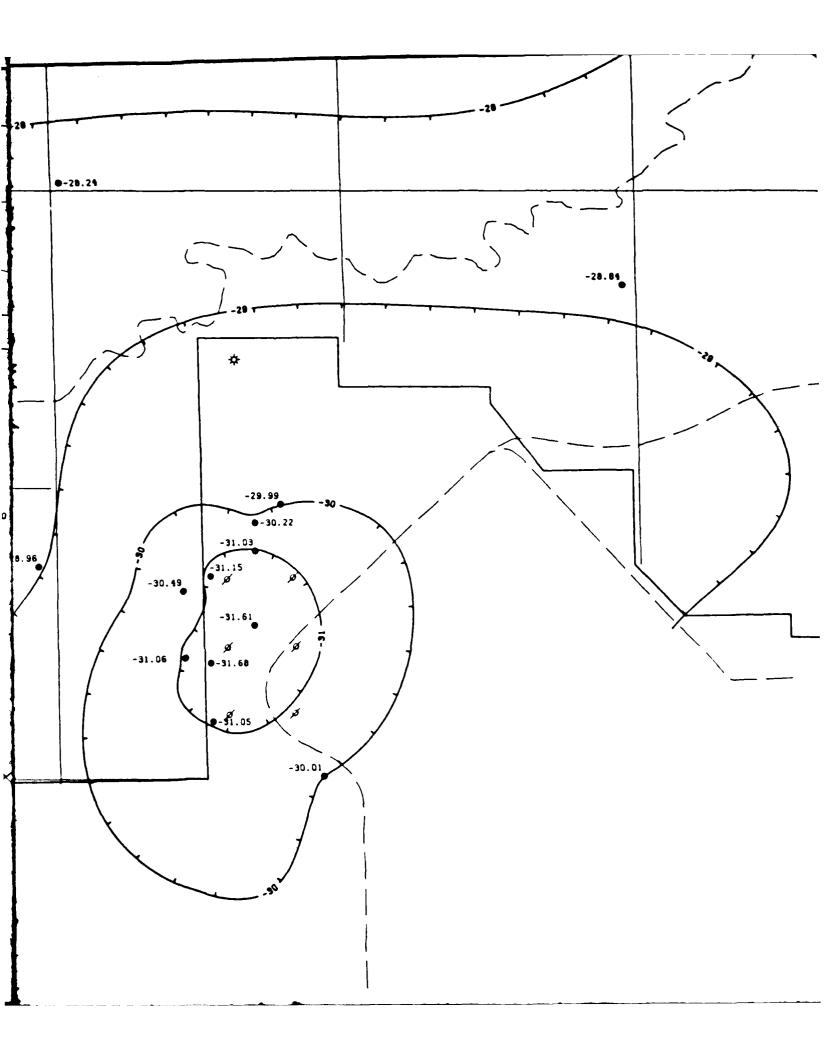


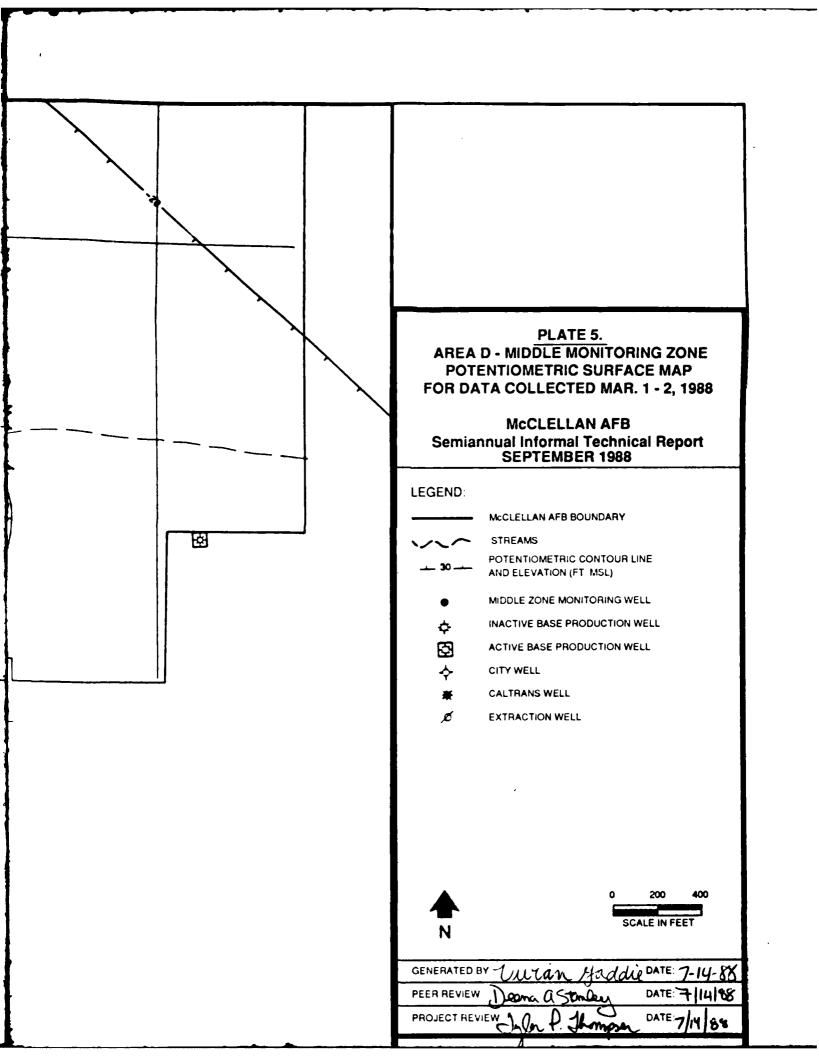


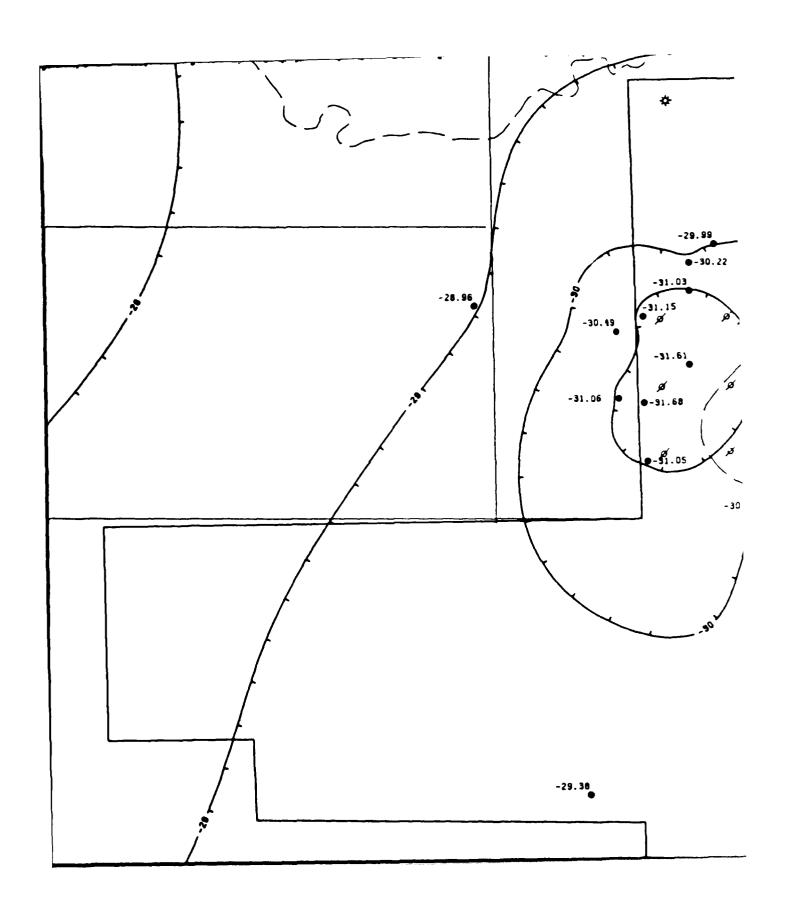


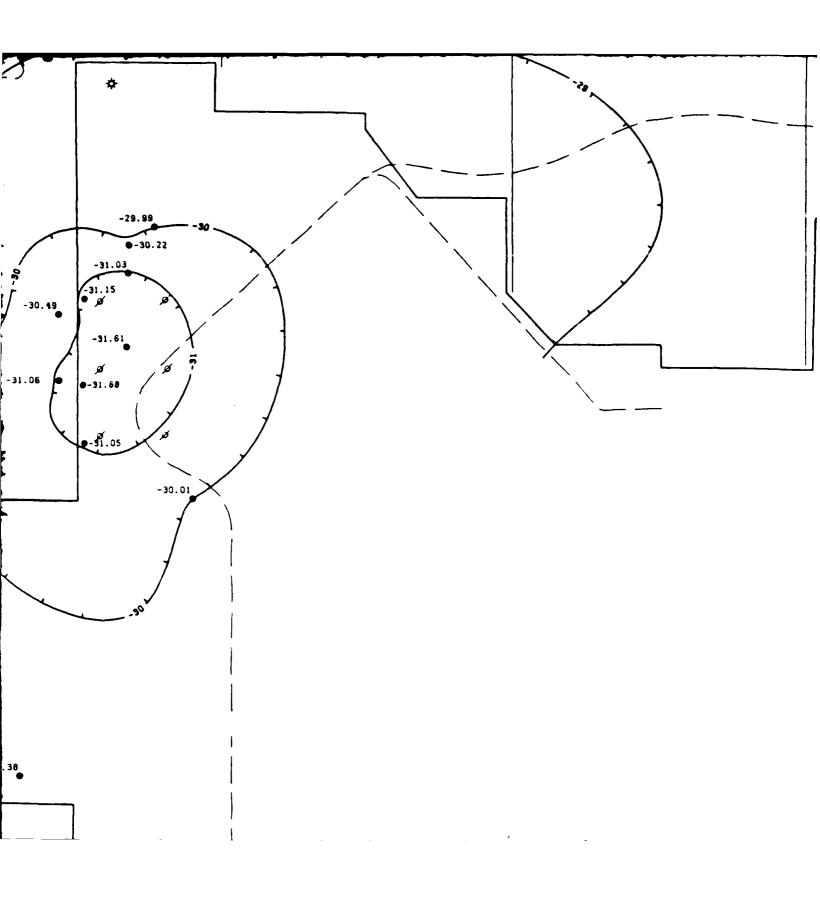


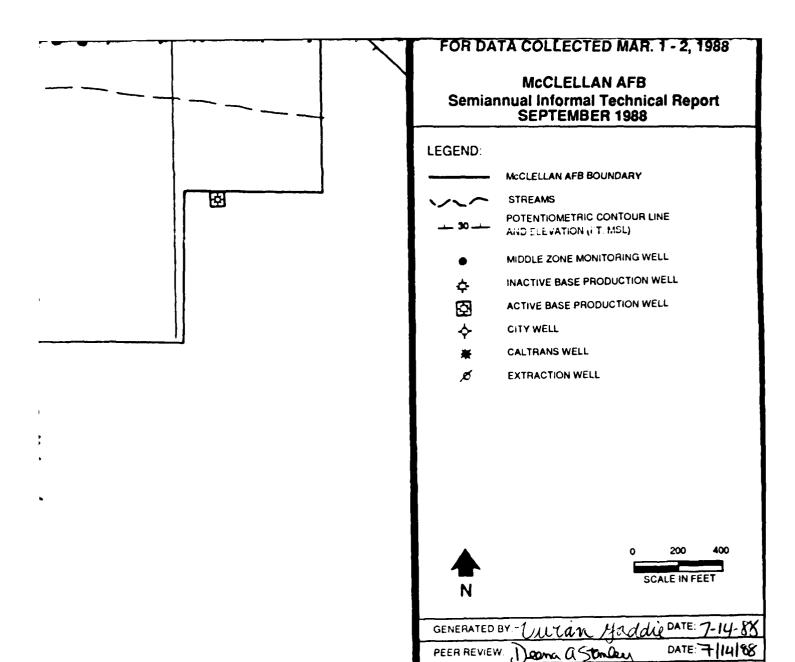






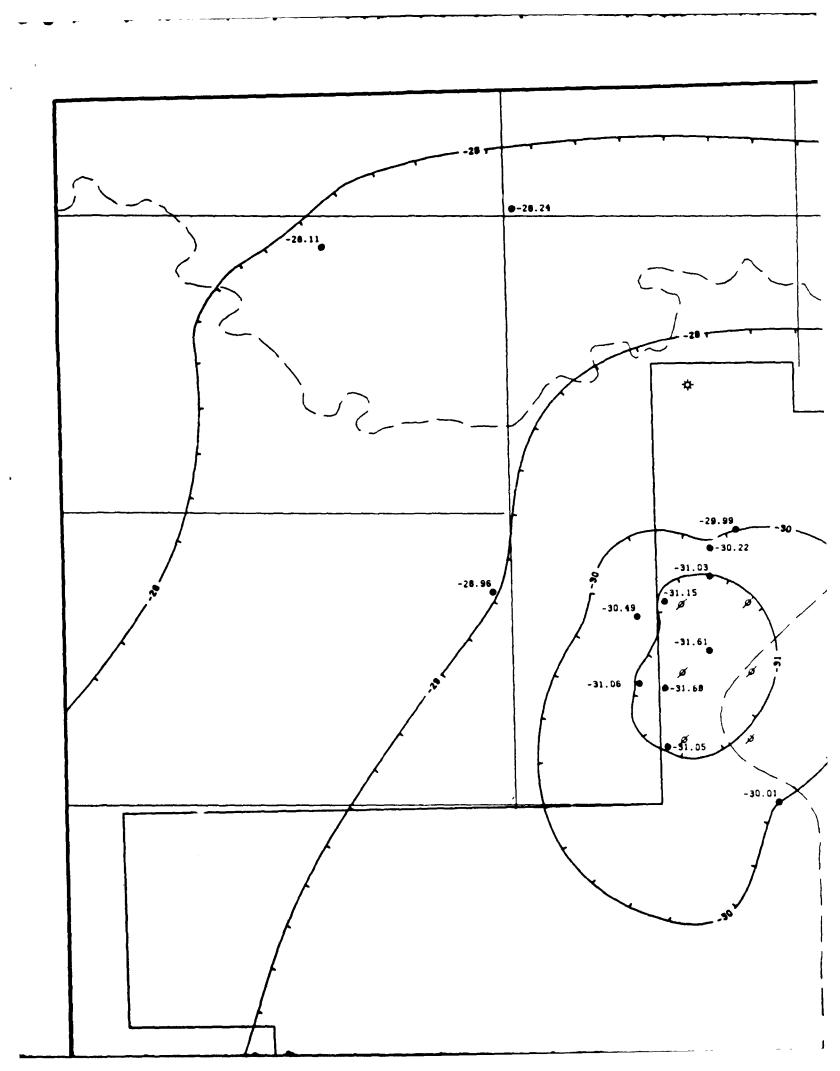


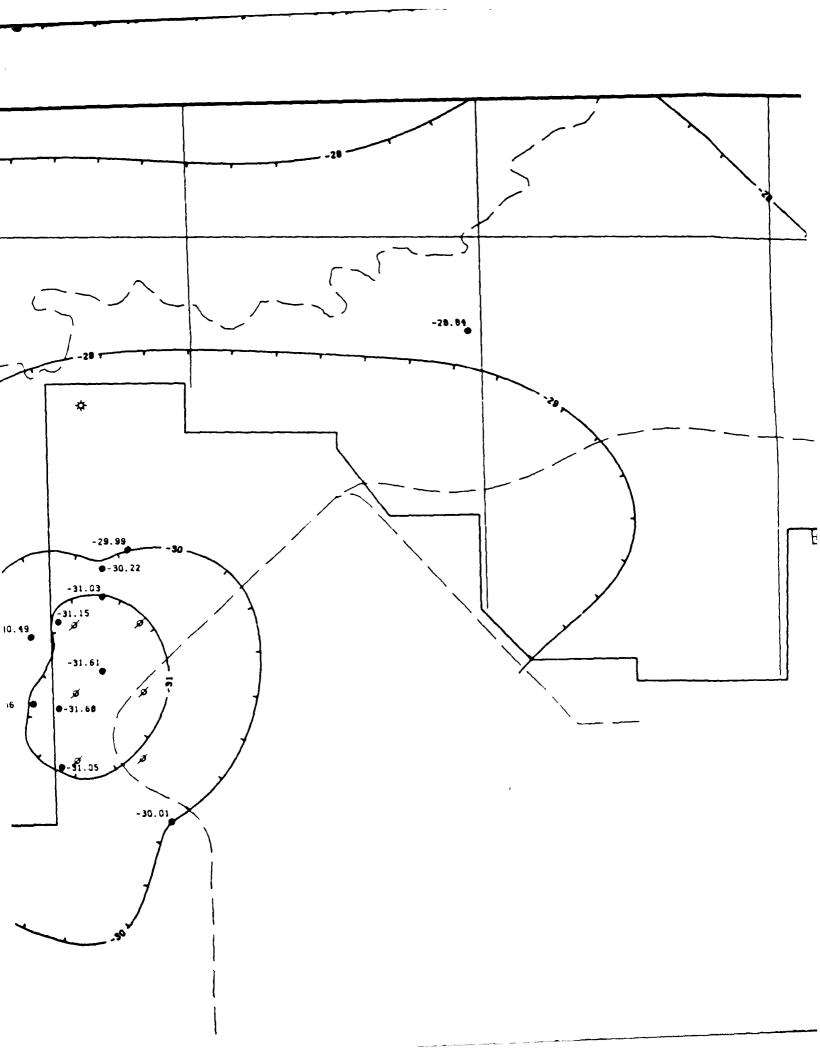


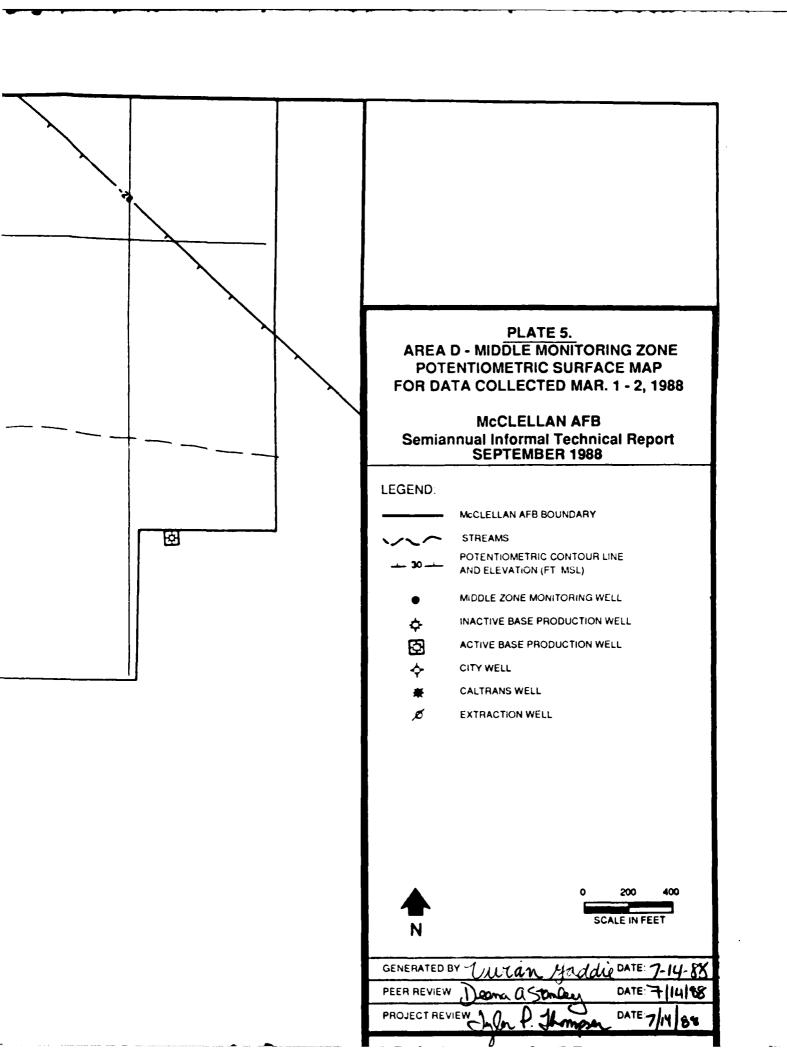


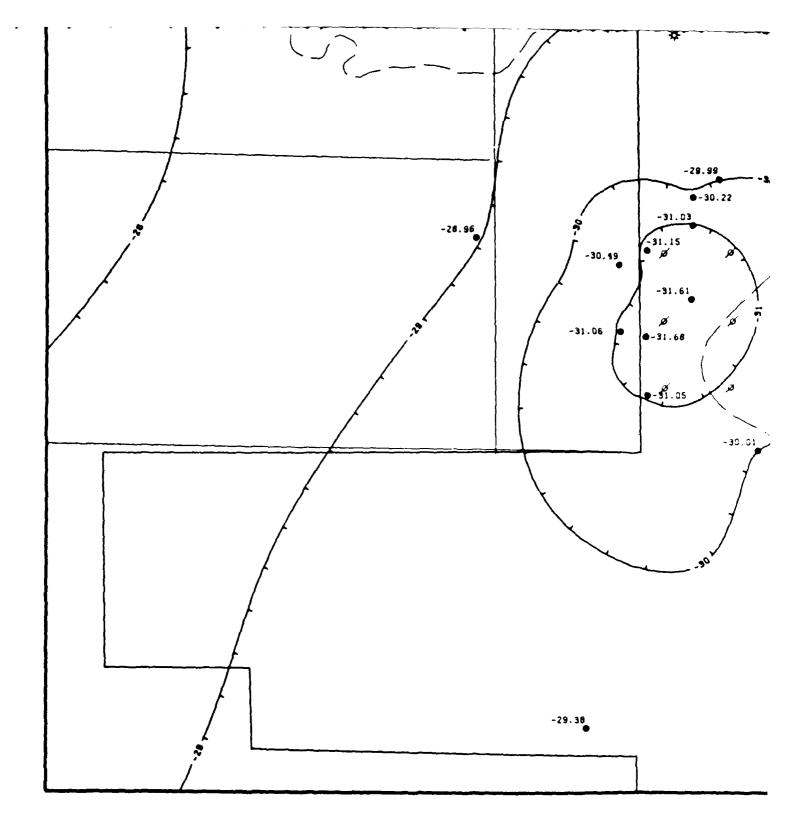
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PROJECT REVIEW









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